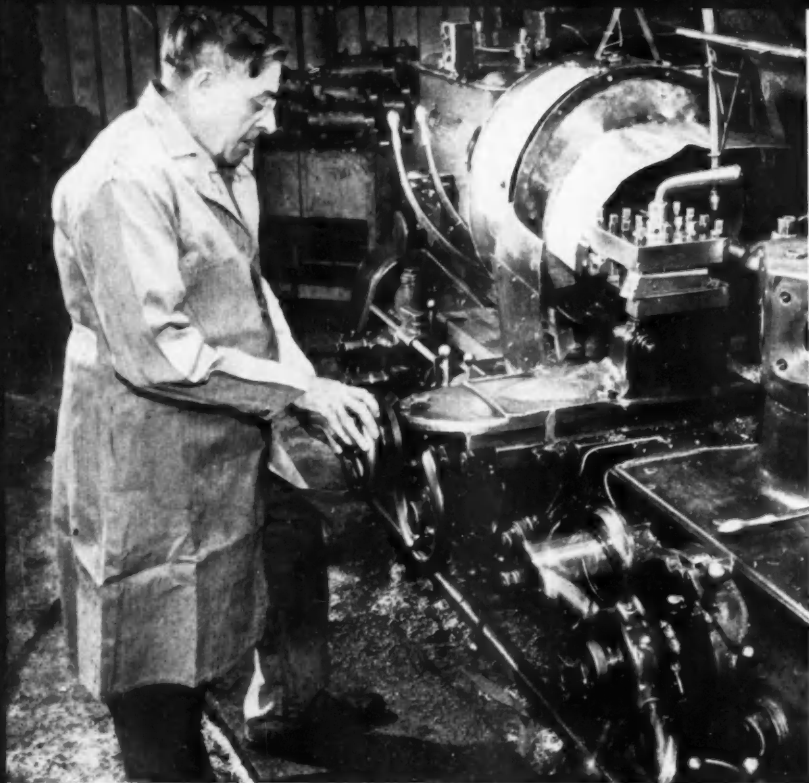


AAI AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING
C I V I L I A N A N D D E F E N S E

In This Issue . . . Low Cost Blanking Dies . . . Half Century of
OCTOBER 1, 1952 Cadillacs . . . Special Testing Machine Setups
Complete Table of . . . Continuous Press Forging Crankshafts . . .
Contents, Page 3 Jet Age Problems . . . Arc Energy Measurement

A C H I L T O N P U B L I C A T I O N



Ends taper troubles on boring job

● Miller Products of North Chicago, Illinois, used a turret lathe boring operation to produce dynamotor housings from 1015 steel tubing. Various cutting oils were tried on this job. With all but one of these oils, taper on the bore of the housings was excessive. In some cases, only one housing out of fifty was acceptable. STANICUT Oil 107 BC, recommended by a Standard Oil lubrication specialist, alone produced satisfactory results!

With the use of this cutting oil, taper has been kept to a minimum. Tool life and finish have been excellent. Production has averaged between 80 and 132 housings per tool change.

Of still greater benefit to Miller Products, STANICUT has proved its ability to handle a wide variety of difficult machining jobs. Operators have used it success-



fully on stainless steel, stress proof steel, and 4140 steel in turret lathes, automatic screw machines, and threaders.

Make the experience of Miller Products your basis for trying STANICUT Cutting Oil. You can get the help of a Standard Lubrication specialist by phoning your local Standard Oil (Indiana) office. Or, write: Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

What's YOUR Problem?



W. P. Spencer, lubrication specialist in Standard Oil's Chicago office, worked closely with Miller Products to help them solve a serious machining problem.

To help you with similar problems, Standard Oil has a corps of lubrication specialists located throughout the Midwest. One of these men is near your plant. He is close-at-hand to give you the assistance you need when you need it. His wide experience and special training in the use of modern lubricants and cutting fluids will help you make real savings. You can reach him quickly and easily by phoning your local Standard Oil Company office. Arrange soon for his visit and find how you can profit further through Standard's unique service-supply set-up. Find, also, how you can benefit from such outstanding products as:

STANICOOL HD Soluble Oils—Because they contain additional compounding, these heavy-duty soluble oils possess not only the cooling ability of an emulsion but also the ability to give better tool life and finer finishes than can be obtained with a conventional soluble oil.

STANOSTAMP Compounds—Here are three established products for stamping or heavy drawing operations of either low-carbon or alloy steels. Water can be added to these paste compounds to provide the most economical applications. STANOSTAMPS offer maximum protection for dies and work. These compounds can be readily removed in conventional washing equipment.

STANDARD OIL COMPANY



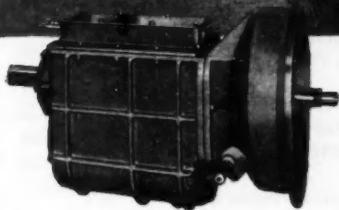
(Indiana)



down through the ocean shelf for oil...

COTTA TRANSMISSION

takes continuous heavy shock load!



Designed for
A Broad Range of Ratios
And Input Torques
From 150 to 2000 Foot Pounds

Drilling for oil in nature's tidelands is tough business. Tough drilling through layers of stone and solid rock. Tough on men and machines. Tough, certainly, on the transmission that powers the rig. But it's the kind of business "tough" Cotta Transmissions are built especially for.

In transmitting the high, constant speed of the engine to ratios suitable for drilling, this Cotta Multi-Speed Transmission is on a continuous, heavy-duty assignment. It's an assign-

ment where heavy shock loads result from the varying layers of rock, stone, sand, and muck. It's also an assignment where equipment failure cannot be risked!

Specialization has taught Cotta the "fine points" in design and construction of Heavy-Duty Transmissions and Reduction Units. So, if you build cranes, locomotives, drillers, generators, shovels, pumps or other heavy-duty equipment... why not see what Cotta has to offer you.

THIS INFORMATION WILL HELP YOU

Sent free on request — diagrams, capacity tables, dimensions, and complete specifications. State your problem — COTTA engineers will help you select the right unit for best performance. Write today.

COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS



COTTA

HEAVY-DUTY
TRANSMISSIONS

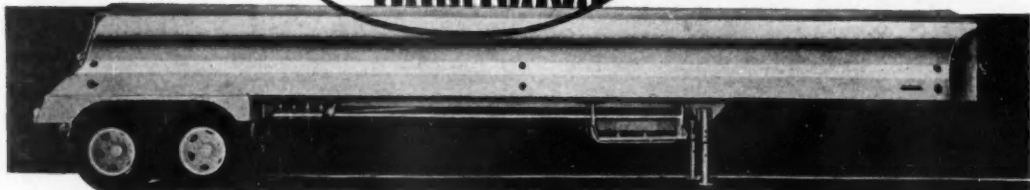
"Engineered-to-order"

HOW THE DEADWEIGHT OF EIGHT MEN

1400 lbs.
is
converted to payload
BY "Cor-Ten" Steel



Giant 6,250 gallon gasoline tank built of United States Steel's "Cor-Ten." The combined weight of the eight men, 1400 pounds, represents the eliminated deadweight or the additional free payload made possible by the use of the high strength, low weight, copper-chromium-and-nickel-alloy steel.



230 gallons of gasoline are transported free everytime this 6,250 gallon trailer tank rolls out on the road for The Trailmobile Company, Inc., of Springfield, Missouri.

Why? Because this extra payload replaces the 1400 pounds of deadweight eliminated in construction by using "Cor-Ten," a low-alloy steel.

"Cor-Ten," a steel containing copper, chromium and nickel, has high strength, higher than carbon steel, which makes possible the use of lighter gauges with a saving in deadweight.

"Cor-Ten" steel also has the abrasion, corrosion and erosion resistance so essential for long, trouble-free service life.

What's more "Cor-Ten" (like the many other trade-named high strength, low alloy steels containing nickel) is easy to work with. It forms without difficulty and welds readily without special treatment.

Does such lightweight, high strength steel offer you the possibility of maintenance and shipping cost savings? Then investigate the trade-named high strength nickel structural steels.

At the present time most of the nickel produced is being diverted to defense. Through application to the appropriate authorities, nickel is obtainable for the production of engineering nickel alloy steels for many end uses in defense and defense supporting industries.



THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET
NEW YORK 5, N.Y.

AUTOMOTIVE INDUSTRIES

October 1, 1952

Published Semi-Monthly

Vol. 107, No. 7

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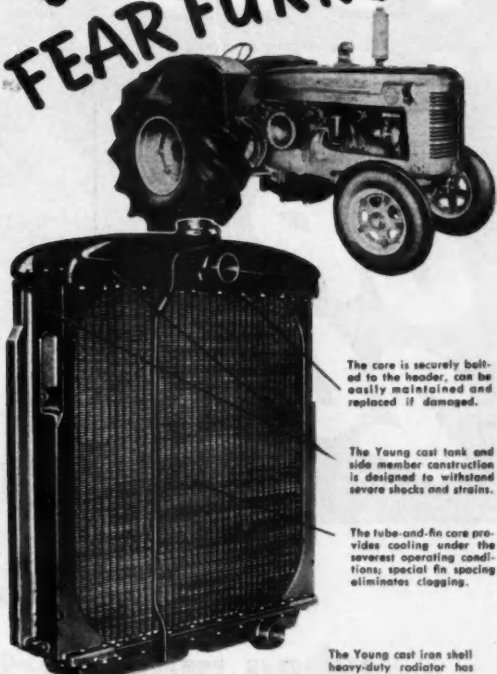
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AUTOMOTIVE INDUSTRIES, October 1, 1952

THE RADIATOR THAT DOESN'T FEAR FURROWS



The core is securely bolted to the header, can be easily maintained and replaced if damaged.

The Young cast tank and side member construction is designed to withstand severe shocks and strains.

The tube-and-fin core provides cooling under the severest operating conditions; special fin spacing eliminates clogging.

The Young cast iron shell heavy-duty radiator has proved its ruggedness on the International Harvester 9-series wheel tractors.

YOUNG

BUILDS RUGGED RADIATORS THAT COOL THE JOB AND CUT MAINTENANCE COSTS

It will pay you to investigate the advantages of the Young Agricultural Radiators. The combination of a new type core; cast iron tank and side members with reinforcing at the points of greatest stress assures International Harvester customers proper cooling and long life for the 9-series steel or rubber-wheel tractors.

Young Sales Engineers will be pleased to show examples of Young engineering and production solutions to problems similar to yours. Write us today.



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Heat Transfer Products for Automotive and Industrial Applications.

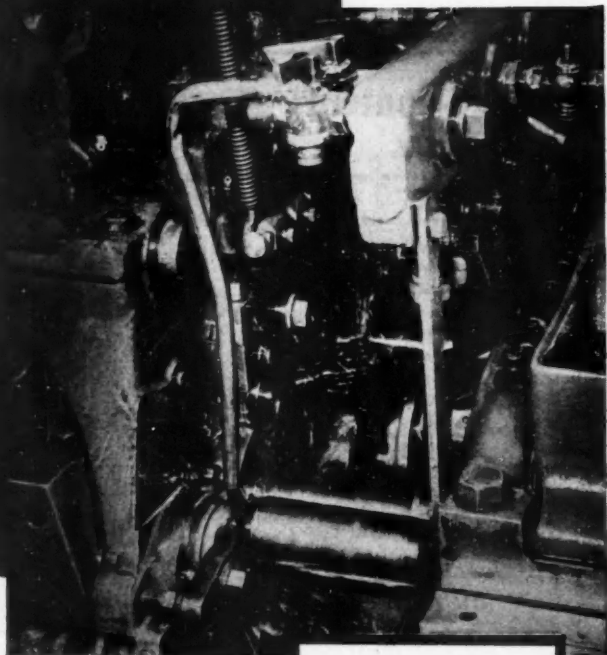
Heating, Cooling, Air Conditioning Products for Home and Industry.

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TOOL LIFE

UP 20%



...when manufacturer changes to **TEXACO CLEARTEX OIL**

Job: Machining plunger pins
for M48A3 fuse

Machine: Davenport Auto-
matic

Metal: #416 stainless steel

Coolant: Texaco Cleartex
Oil AX

Buchmann Spark Wheel Co., manufacturer of screw machine parts, Long Island City, N. Y., wasn't satisfied with the way a competitive cutting oil was performing on this job of machining stainless steel. Tool life was short, finish not all it should be. So they called in a Texaco Lubrication Engineer who recommended *Texaco Cleartex Oil*.

Improvement was noted immediately. Finish was much superior and tool life was increased some 20%.

Texaco Cleartex Oil is just one of a complete line

of Texaco Cutting, Grinding and Soluble Oils designed to help you do *all* your machining better, faster, and at lower cost. A Texaco Lubrication Engineer will gladly help you get these results whatever the metal you are working or your method of machining it.

Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

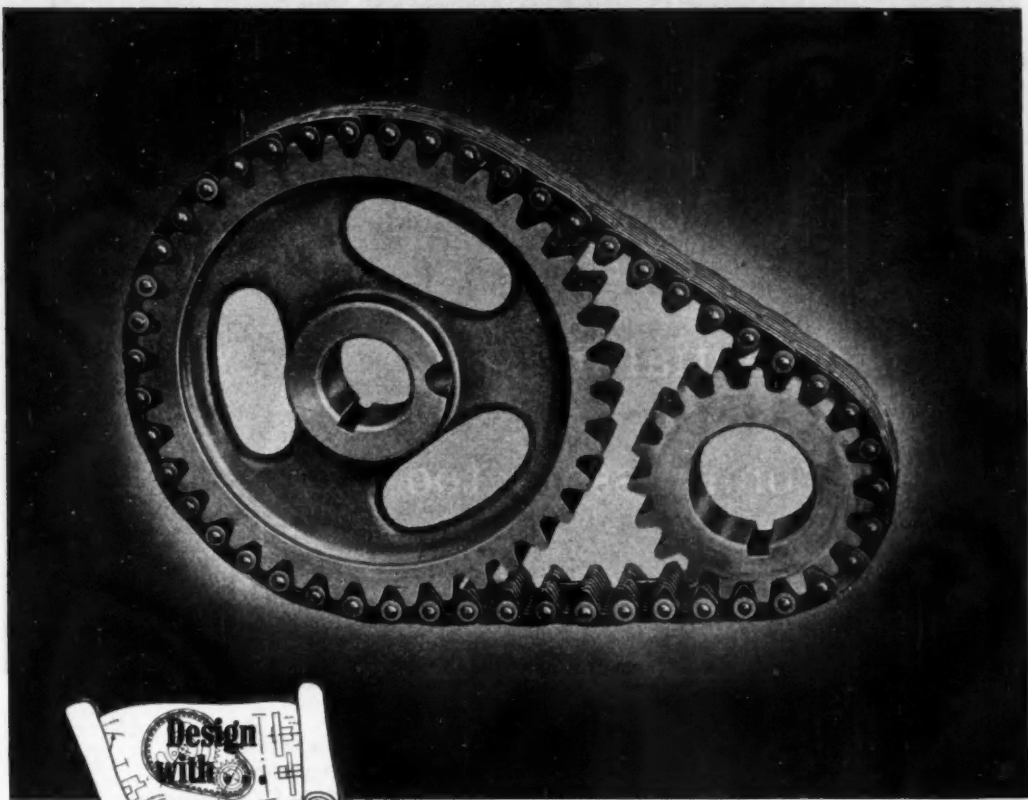
TEXACO CUTTING, GRINDING AND SOLUBLE OILS FOR FASTER MACHINING

Faithfully yours
50
Texaco
for Fifty Years

TUNE IN: Tuesday nights on television—the TEXACO STAR THEATER starring MILTON BERLE. See newspaper for time and station.

Be sure you get all 3...

✓ Automatic joint snugness ✓ Smoother operation ✓ Longer life



Link-Belt Timing Chain

Segmental Bushings provide
automatic joint snugness



Segmental bushings are made with slight bow.



After initial assembly in chain, bushings are straight.



Bow in bushing acts to keep a snug joint, maintaining chain pitch automatically.

THE secret behind Link-Belt Timing Chain's smoother operation and longer life is the exclusive Segmental Bushing. Note in the sketches above the automatic compensation for wear—provision for complete joint snugness at all times.

Equally important, the facilities of the world's largest chain plant are your assurance of a con-

tinuing supply. Constant research keeps you informed on latest technical advances. Engineering and specification details are in Book 2065.

LINK-BELT

TIMING CHAINS and SPROCKETS

LINK-BELT COMPANY: 220 South Belmont, Indianapolis 6, Ind. Offices in principal cities.

Perfect Balance

is essential in
air compressors, too

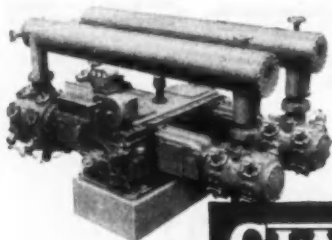


In air compressors, perfect balance is of *prime* importance. It means vibration-free performance.

Clark Balanced/Opposed, Motor-Driven Compressors are the *first* heavy duty air compressors to incorporate perfect balance, therefore the first to assure you of *all* these advantages in the 150 — 4500 horsepower range:

- Installation anywhere—on upper floors, steel framework, alongside delicate machines.
- Substantially reduced foundation requirements.
- Extra long compressor life, with a minimum of maintenance.
- No vibration or noise to be transmitted within the plant or to nearby buildings.

For complete information on the truly modern Clark Balanced/Opposed Compressor line, request Bulletin 118.



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balanced/opposed compressors

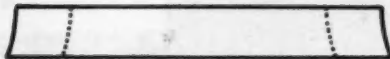
PRECISION BY THE TON

© 1952, Clark Bros. Co., Division of Dresser Operations, Inc.

How to remedy common errors in gasket design

The Fault

Requiring vertical edges on resilient washers and rings.



The Reason

Die-cutting soft or easily compressible gasket materials produces concave walls in the finished washer or ring, especially in thicknesses over $\frac{1}{8}$ ". Vertical edges can be made, of course, but washers made this way generally are somewhat higher in cost than simple die-cut washers.

The Remedy

Don't insist on vertical edges on resilient washers and rings unless they are necessary. Vertical sides may be needed in some cases . . . for example, where the O. D. of the ring is the sealing surface. Otherwise, they may be an unnecessary expense.



For additional helpful information on the design and use of gaskets, read "Armstrong's Gasket Materials." This 24-page manual discusses subjects such as designing gaskets to reduce costs . . . designing flanges for efficient sealing . . . the effect of surface condition on gaskets, and many others.

You'll also find up-to-date information on Armstrong's various sealing and friction materials. Included are government and SAE-ASTM specifications. See this manual in Sweet's file for product designers. For a personal copy, write Armstrong Cork Co., Gaskets and Packings Dept., 1510 Arch St., Lancaster, Pa.

ARMSTRONG'S Gasket Materials

Eatonite-Faced Valves

an Important Advancement in Lengthened Valve Life



Eatonite—a heat resistant, corrosion resistant, and wear resistant alloy applied to valve faces by special Eaton-developed techniques—adds materially to valve life in commercial vehicles and heavy-duty industrial engines. An important factor in the outstanding performance records being set by Eatonite-faced valves is the homogeneous structure produced by the Eaton process of applying the hard-facing material. Eatonite-faced valves come well within practical limits from the standpoint of cost; pay for themselves many times over in lengthened life span and freedom from valve trouble. Best results are obtained when Eatonite-faced valves are used in conjunction with Eaton valve seat inserts.




Eatonite-Faced Valves are available as solid valves or as hollow sodium cooled valves.

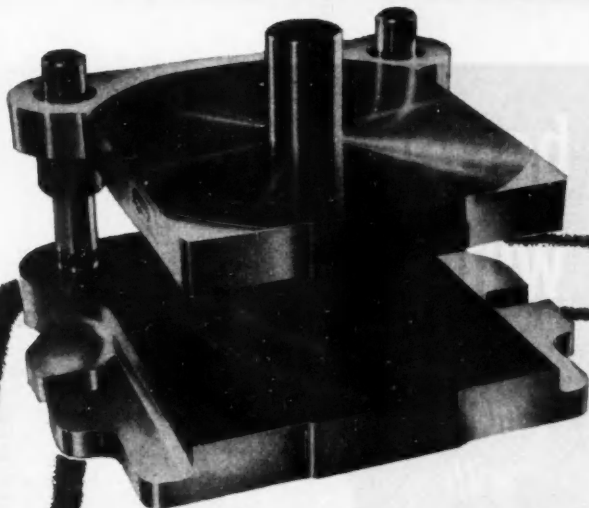
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MANUFACTURING COMPANY

General Offices: CLEVELAND, OHIO

VALVE DIVISION: 9771 FRENCH ROAD • DETROIT 13, MICHIGAN

 **PRODUCTS:** Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings • Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

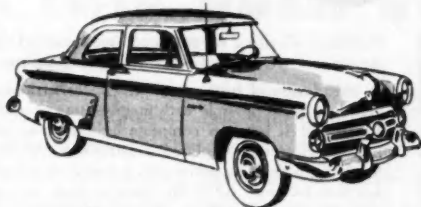


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helped FORD retool for '52

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2100 South Laramie Avenue • Chicago 50, Illinois



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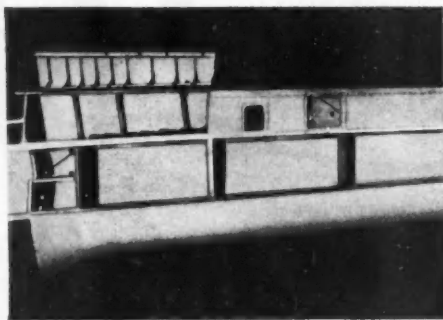
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DIE SETS AND DIEMAKERS' SUPPLIES

better
wings
can be
made
with

MAGNESIUM



Problems of critical weight, increased torsional rigidity, and simplified design can often be solved by using magnesium.

In the design of high-speed wings, for instance, the use of a thick skin . . . made possible with magnesium . . . offers many advantages. Illustrated at left is a complete fighter plane wing made with magnesium. Note the simplified construction. Although this wing, ready for flight, weighs no more than a conventional wing, *torsional rigidity has been increased 50%*! By using a thick magnesium skin, all span-wise stringers and half the ribs were eliminated, reducing the number of parts 69%, the number of fastenings 62%, and adding fuel capacity that increased the plane's range 18%!

Wherever the combination of strength and light weight are a design necessity, look at magnesium. Recent technical advances in alloying, fabricating and finishing have made magnesium a leading metal for aircraft construction.

THE DOW CHEMICAL COMPANY

Magnesium Department • Midland, Michigan

New York • Boston • Philadelphia • Atlanta • Cleveland • Detroit
Chicago • St. Louis • Houston • San Francisco • Los Angeles • Seattle
Dow Chemical of Canada, Limited, Toronto, Canada



This 120-barrel capacity bulk cement trailer was built of Mayari R low-alloy, high-strength steel by Clough Equipment Service, Seattle, Washington.



THEY CUT 1500 LBS DEADWEIGHT FROM THIS BULK CEMENT TRAILER

Low-alloy, high-strength steel did it. By using Mayari R the builders of this bulk cement semi-trailer were able to reduce the deadweight by 1500 lbs while adding to the overall strength.

The trailer has an all-welded tank-type hopper body, dual axles, flanged-and-dished hopper heads, air jets and vibrators. Heavy truss frames ordinarily used in trailers of this type have been eliminated. Excellent roadability and stability

have been gained by lowering the center line of load.

Mayari R is well suited for vehicles like this because of its higher mechanical properties. It enables designers to use thinner, lighter sections without cutting strength or corrosion-resistance. You can use Mayari R in the as-rolled condition without heat-treatment. You can form and fabricate it by the same methods that you use for plain carbon steel, and weld it by

the usual gas and electric processes.

If you are designing any kind of product where weight reduction, greater strength, or superior resistance to atmospheric corrosion are important, it will pay you to find out more about Mayari R.

Write or phone any of our sales offices for Booklet 259, giving detailed information about Mayari R.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

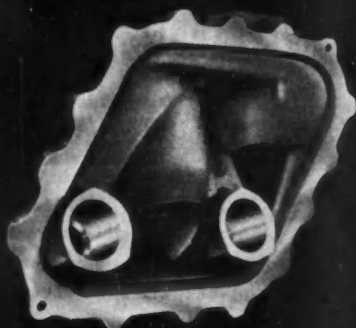
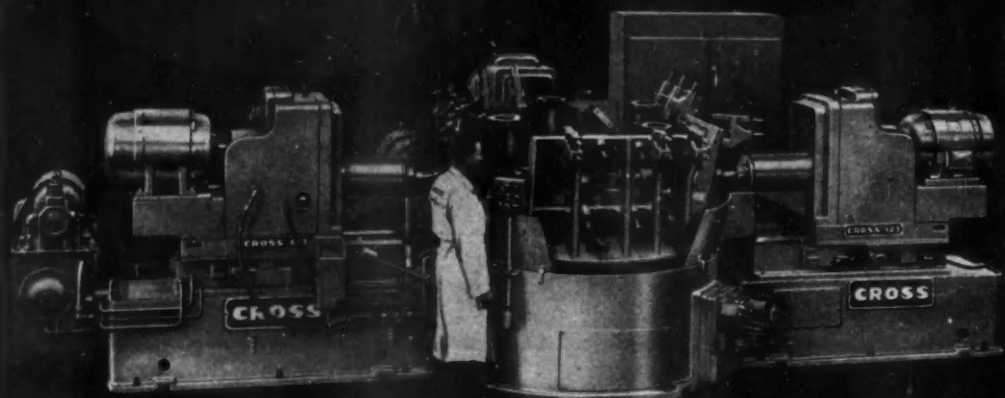
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributors: Bethlehem Steel Export Corporation



Mayari R *makes it lighter... stronger... longer lasting*

Drills and Reams Tank Suspension Support Housings

Another Special by Cross



- ★ Drills and reams two holes of 3.995/4.000 diameter in 11 pieces per hour at 100% efficiency.
- ★ Material: Cast Armor, Rockwell C-42.
- ★ Fluid motor driven index table with four stations—one for loading, one for drilling, one for flat bottom drilling, one for reaming.
- ★ JIC standard hydraulic and electrical construction with stranded wire.
- ★ Other features: hardened and ground ways, hydraulic feed and rapid traverse, pre-set tools, automatic gravity operated cam clamping for the index table.

Established 1898

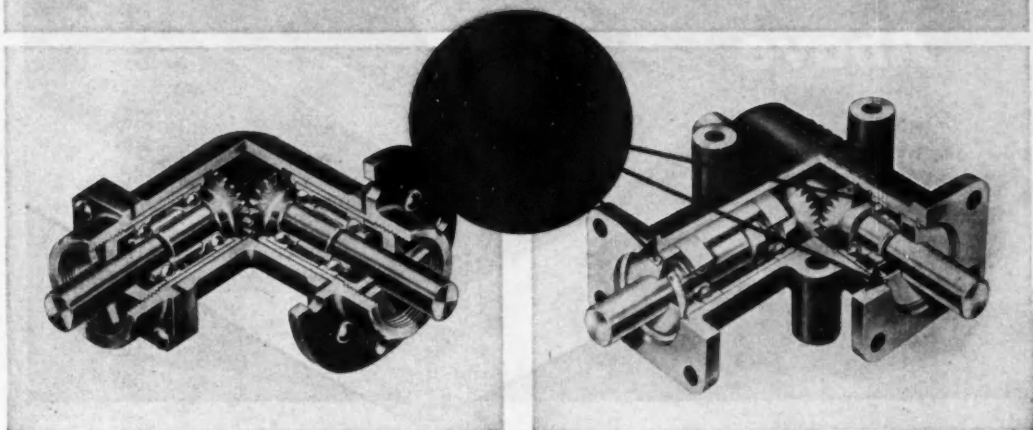
THE

DETROIT 7, MICHIGAN

CO.

Special MACHINE TOOLS

3 Waldes Truarc Rings Replace 19 Parts ...Save \$6.75 Per Unit...Cut Weight by Nearly 16%



OLD WAY 2 Threaded nuts locked bearings in place. 8 screws and washers positioned bearing and shaft assemblies. This fastening method required expensive tapping and threading. Assembly was slow and costly.

TRUARC WAY Two Truarc inverted rings (Series 5008) provide uniform shoulder to lock bearings in place, position bearing and shaft assemblies. Additional Truarc Ring (Series 5100) locates ball bearing...eliminates 1 sleeve type spacer.

Airborne Accessories Corporation, Hillside, New Jersey, uses Waldes Truarc Retaining Rings to take all thrust load from right angle bevel gears in their ANGLgear*. Truarc Rings make ANGLgear* more compact—save approximately $\frac{1}{4}$ " at each end of housing. By providing a choice of 3 mounting possibilities — instead of 1 — Truarc Rings make ANGLgear* adaptable to many different assemblies. New design increases load capacity...eliminates machining of threads.

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Waldes Truarc Rings are precision-engineered... quick and easy to assemble and disassemble. Always circular to give a never-failing grip. They can be used over and over again.

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*Trade Mark of Airborne Accessories Corp.



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WALDES

TRUARC

REG. U. S. PAT. OFF.

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WALDES TRUARC RETAINING RINGS AND Pliers ARE PROTECTED BY ONE OR MORE OF THE FOLLOWING U. S. PATENTS: 2,302,947; 2,302,948; 2,414,092; 2,450,821; 2,458,241; 2,450,789; 2,441,848; 2,445,165; 2,492,390; 2,492,393; 2,497,002; 2,497,803; 2,491,308; 2,509,001 AND OTHER PATENTS PENDING.



Waldes Kohinoor, Inc., 47-16 Austel Place, L. I. C. 1, N. Y.

Please send me the new Waldes Truarc Retaining Ring catalog.

AY 104

(Please print)

Name _____

Title _____

Company _____

Business Address _____

City _____ Zone _____ State _____

**ADHESIVE
COATED**

Above

Below

MACHINES MOUNTED ON *Westorb CAN'T CRAWL*

Westorb adhesive-coated machine mounts are solving more than the problem of vibration. Their (exclusive) adhesive coating on both sides prevents looms and all other machinery from "crawling." Eliminates realignment after installation. This minimizes down time—saves money.

Westorb adhesive-coated felt mountings don't break down under heaviest service impacts. They resist oil, acid, grease, water and age. They are simpler to install than any machine pad. No holes or bolts—no adhesive to apply. Western Felt engineers located throughout the textile areas are anxious to cooperate.

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Branches in all Principal Cities

**Felt
WORKS**

MANUFACTURERS AND CUTTERS OF WOOL FELTS

WESTSORB

Vibration-absorbing Machine Mounts

- Quickly installed
- No holes to drill
- No adhesive to apply
- Low "down-time"
- Saves floors
- Less machine repair
- Reduce plant noise
- Thickness for every need
- Engineered for every job

Western Felt Works
4035-4117 Ogden Ave., Chicago 23, Illinois

Please send 16-page booklet containing data on efficiency tests of Westorb machine mounts under looms and other equipment.

Company

Address

Individual

Title

Delpark

Studebaker

Cleaner, trouble-free grinding operations, speed production, save money at the Studebaker Corporation Plant in South Bend, Indiana.

Delpark Filters insure clean coolant in grinding operations . . . permit freer cutting wheels, lengthen coolant life, and eliminate downtime of grinders for cleaning of reservoirs. By supplying clean coolant, machine efficiency is increased, less wheel dressing is required, wheel life is lengthened and greater grinding accuracy is achieved.

Removal of hot particles lowers coolant temperature, retards deterioration. Coolant remains clean, delays coolant becoming rancid.



This Delpark Filter serves as a central system for four centerless grinders. The coolant flow is 120 gallons per minute.

LET A DELPARK INDUSTRIAL FILTERING SPECIALIST SHOW YOU THE FACTS ON THE FINEST IN INDUSTRIAL FILTRATION.

Write for more complete information.

Delpark

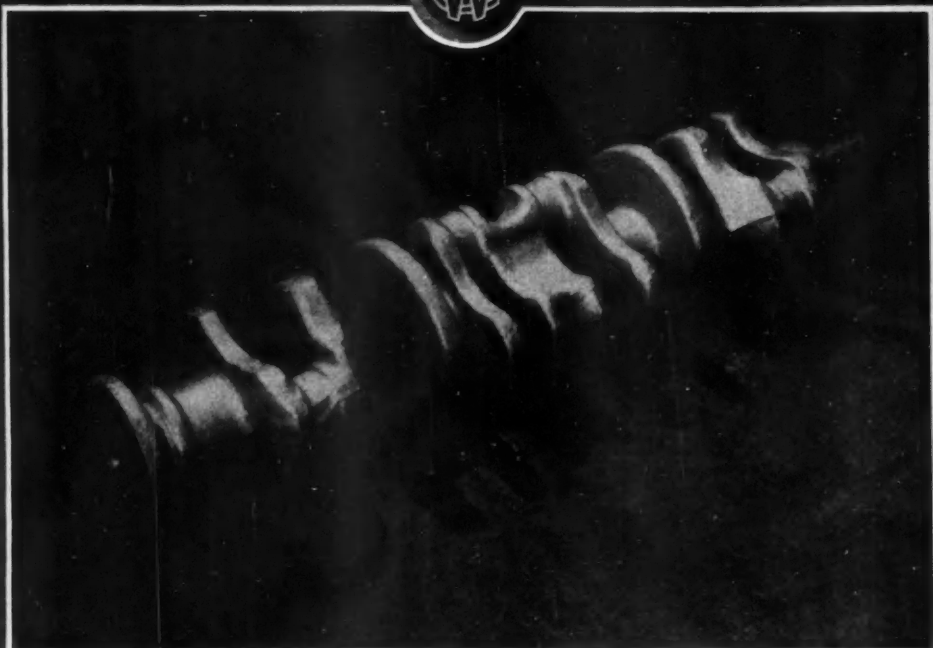
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Backed by 30 Years Experience in Industrial Filtration

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New! Warm Air Pre-Heating for Diesel Engines

Another revolutionary SOUTH WIND first!

Brings the same quick, reliable engine starting enjoyed by major aircraft and military vehicles to any type of diesel engine!

*from this envelope
65,000 B.T.U.!*



**An entirely New application! Works independently of engine heat...engine operation!
Makes starting easier, faster at all temperatures**

Lower in cost! Smaller in size!

Easy to install on practically any diesel model!

Nothing like it now—or ever before! This great new South Wind Pre-Heating advance! Specially designed for diesel applications. Specially engineered to end forever the problem of hard, slow diesel engine starting at any temperature—even at 65° below!

A new principle!

Applies clean, non-corrosive, heated dry air *directly* on friction parts *inside* the engine. Perfected by South Wind, this system also heats the lubricating oils. Assures faster, more efficient warm-up of critical parts than any indirect method of transferring heat.

Resistance to cranking power minimized!

The engine is cranked with warm parts and warm lubrication. Only clean heat is used to raise the temperature of induction air. This factor assures normal and reliable ignition... for quick, sure starting under cold conditions.

Small in size! Light in weight!

Equally effective on either automotive or stationary diesel engines, this new South Wind Pre-Heater burns any required liquid fuel, can be operated automatically or manually. Can be easily, quickly installed on practically any diesel model.

Check these exclusive advantages!

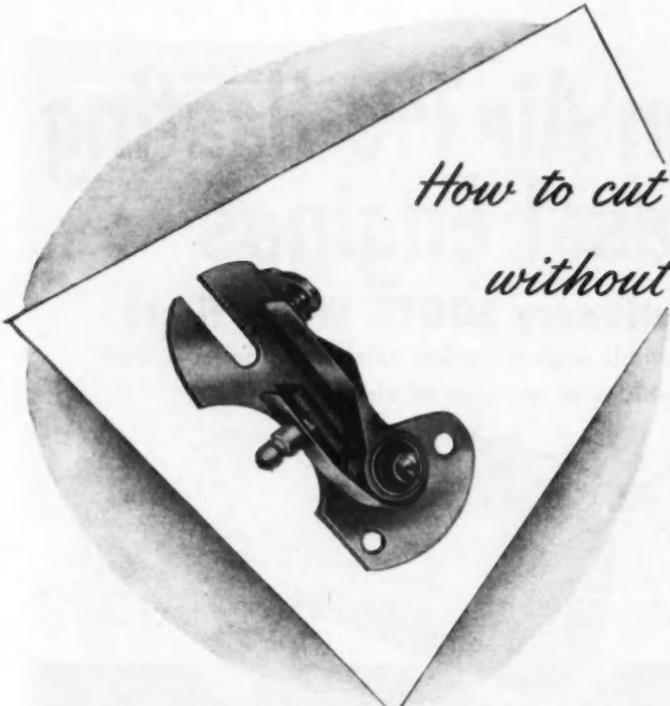
Only South Wind offers them all in this new method of Diesel engine pre-heating

1. Quick, easier starting at -65°F.
2. Conforms to latest military requirements.
3. Adequate lubrication at all times.
4. Lower maintenance cost.
5. Longer engine life.
6. No interrupted service.

Now at your disposal. A staff of experienced South Wind Field Engineers is available to assist you with your specific pre-heating or heating problems. Write today for their help in adapting this or any other model in the complete South Wind line of heaters for commercial, military or civilian use. South Wind Division, Stewart-Warner Corporation, Indianapolis 7, Indiana.



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AIRCRAFT HEATING
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*How to cut contact costs
without cutting corners*

Consider the case of this contact assembly for a large manufacturer. The contact material is tungsten. The entire assembly consists of 16 separate parts... including springs, bushings, rivets and cam blocks.

Originally Mallory supplied only the contacts. Other parts were bought from various suppliers. Still others were made in the manufacturer's own plant where he also handled the complete assembly operation.

Then he discovered the economy of having Mallory do the entire job—from material procurement and inspection... to fabrication and finishing of parts... to final assembly. The burden of ordering, delivering, scheduling, warehousing and production is now in the hands of men who are thoroughly qualified by years of experience in the production of all kinds of contacts.

This manufacturer is using tens of thousands of these contacts every month. By letting Mallory make the complete assembly he has concentrated production responsibility and is getting a better assembly at a lower cost.

Call or write Mallory today. You'll find, as this manufacturer did, that it pays in many ways to depend on Mallory for your complete contact assembly needs.

EXPECT MORE...GET MORE FROM MALLORY

In Canada, made and sold by Johnson Mather and Mallory, Ltd., 110 Industry St., Toronto 15, Ontario

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Electromechanical—Resistors • Switches • Television Tuners • Vibrators
Electrochemical—Capacitors • Rectifiers • Mercury Dry Batteries
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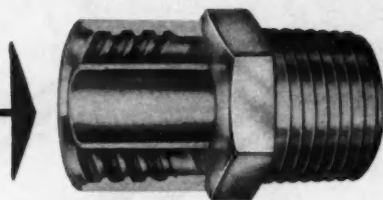
P. R. MALLORY & CO., INC., INDIANAPOLIS 6, INDIANA

For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio.

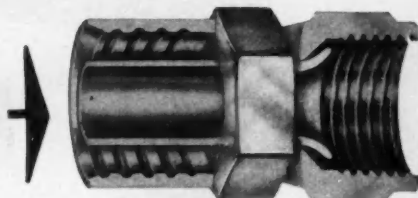


FLEX-O-TUBE

...finds brass makes fine fittings



Flex-o-Tube Hose, and cross section of machined male fitting.



Cross Section of machined and flared female fitting.

For quick, accurate and economical machining, free-cutting brass rod is preferred by many companies, such as Flex-O-Tube, Division of Meridan Corporation, Detroit, Mich. This company makes hose assemblies and fittings to conduct air-oil-water-gasoline and hydraulic power for the automotive, farm implement, machine tool and aircraft industries. Some of these hoses have a minimum bursting pressure of 20,000 pounds per square inch, which gives an indication of the tightness required, which can be obtained only by strength and accuracy.

Flex-O-Tube has found six points of superiority for brass over other metals, as follows:

1. Brass "flows," or is ductile, so that no cracks result during the crimping operation required to fasten the fittings to the hose.
2. Ductility and strength inherent in brass act to provide a superior seat to fittings designed to control fluid flow. Competitive metals are either too hard or too soft to give positive closing and tend to leak.
3. Where the design of the fitting is intricate, necessitating removal of considerable metal by machining, the automatic screw machines can be run faster with free-cutting brass rod.
4. Brass has a high scrap value, and the scrap sold back to the mill increases brass supplies.
5. The break-even point between brass and other metals is especially favorable to brass in the sizes of rod that Flex-O-Tube buys.

6. Customer preference is for brass, which is universally recognized as a quality metal. Hence brass fittings are more readily sold, and in fact often are specified regardless of size or price differentials.

Included in the Flex-O-Tube operations are machining, flaring, crimping, and annealing to assure the proper ductility for flaring and crimping.

Revere is an important supplier of brass rod to Flex-O-Tube, and has also collaborated with this customer through the Revere Technical Advisory Service.

If you wish information about brass and how one or more of the Revere brasses can add to the economy and saleability of your product, get in touch with the nearest Revere Sales Office. See your telephone directory or write direct.

REVERE

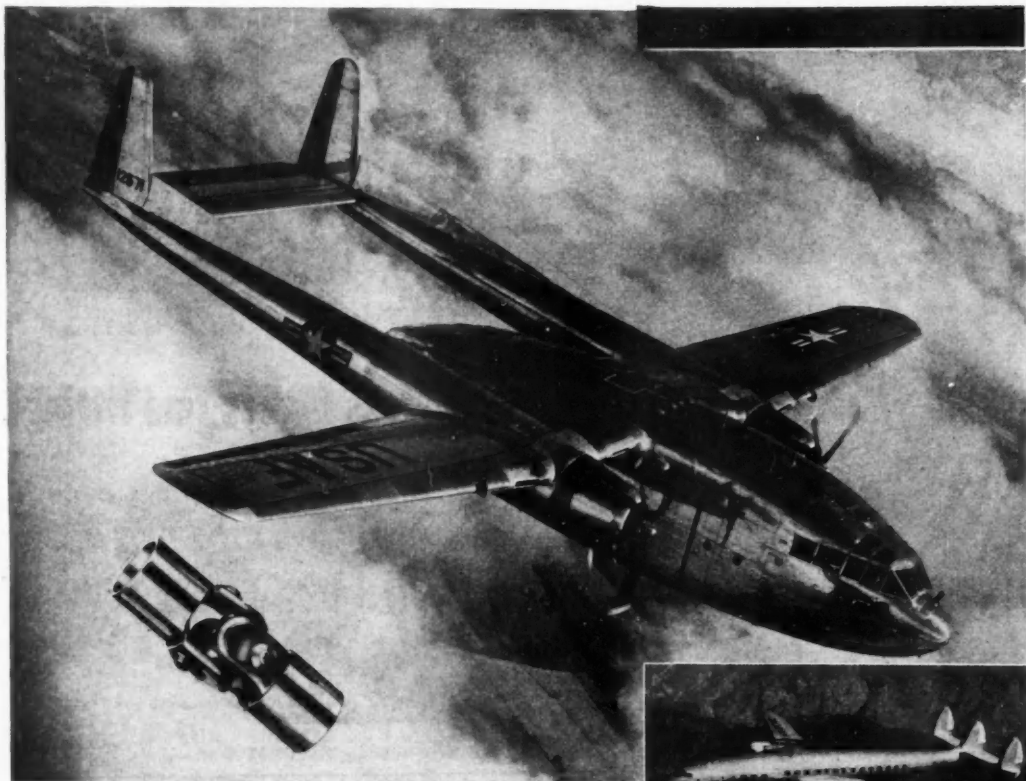
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voltages...

12



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R/M leadership in friction materials is traditional in *many* industries: mine machinery, farm equipment, machine tools, and office equipment, to name a few. And in the automotive field you'll find indisputable evidence of R/M leadership. The record shows that more cars, trucks and buses use R/M brake linings, clutch facings, and

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Your R/M representative is ready to help you now. He can work from samples, from designs on paper, or from figures on horsepower developed, combined with desired performance characteristics. Behind him stand the full facilities of the world's largest maker of friction materials . . . with six great plants, their research departments, and their testing laboratories.

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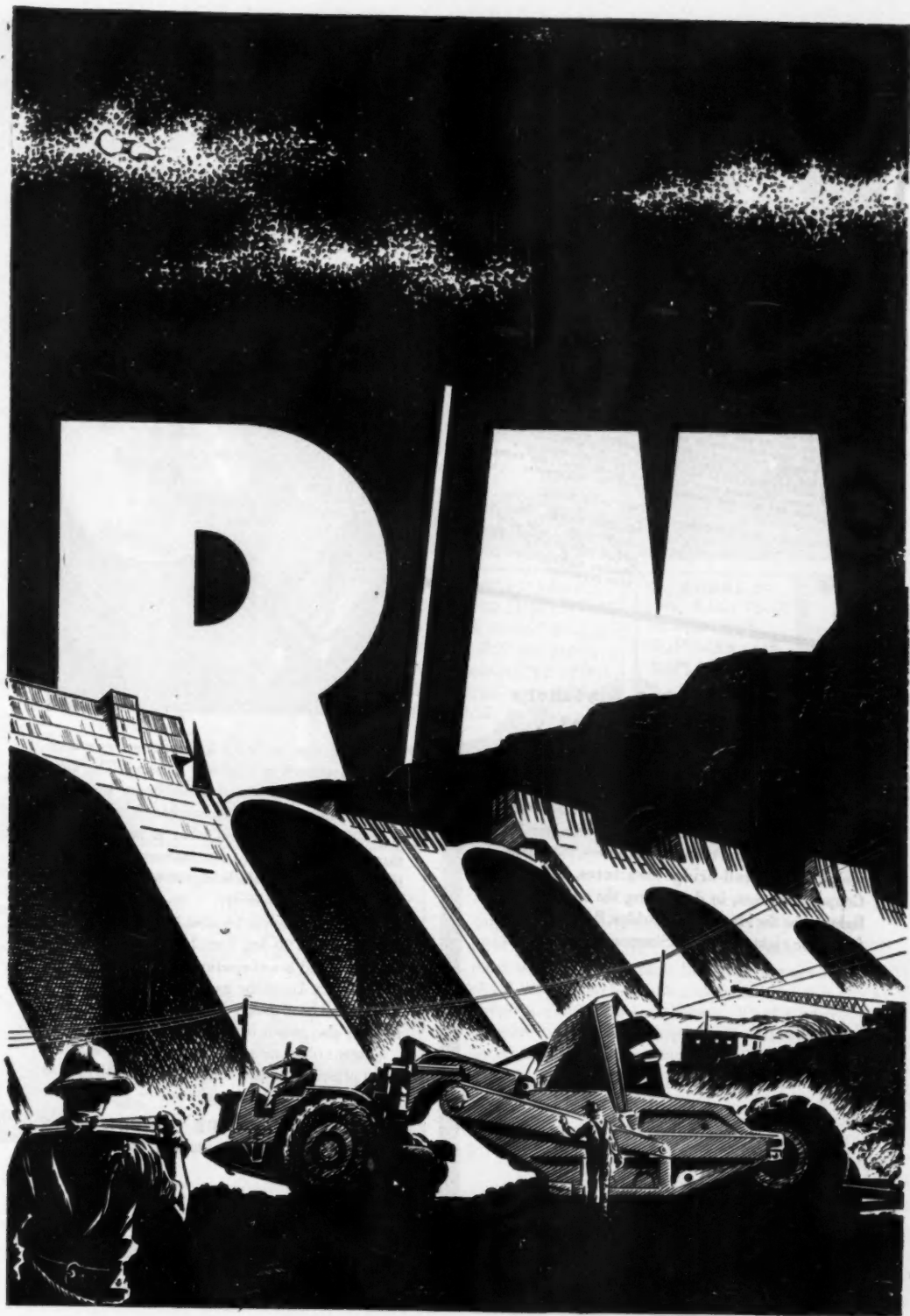
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Engineers-Manufacturers

79 FRANK STREET - BROOKLYN 1, N.Y.
TELEPHONE BR 6-2000

September 17th, 1951

Mr. Harry Rose,
Simmons Fastener Corp.,
Albany, New York.

Dear Mr. Rose:

When a job is well done, too many of us neglect to take a moment to thank those who helped make it possible.

Many problems faced us in the design of the novel lighting units which we supplied for the glare-less roadway lighting of the Mystic River Bridge in Boston. The units had to be secured against theft as they were solid bronze, they had to be sealed substantially weathertight to protect the transformer and wiring and yet they had to be readily removable for lamp replacement with a simple tool. The use of Simmons Fasteners provided an ideal answer to these and other requirements. Your prompt cooperation and excellent service was very helpful in creating a novel lighting unit which has given excellent service and met all the requirements of the engineers.

Very truly yours,

TALLER & COOPER, INC.

Stanley A. Krell
Stanley A. Krell,
Vice President

"The use of Simmons Fasteners provided an ideal answer"

Getting the right answer—engineering and production-wise—is the day-by-day business of Taller & Cooper, Inc. This engineering and manufacturing company has produced many unusual designs for power control, wind tunnels, computers, automatic weighing and toll-bridge structures. Taller & Cooper engineers, in developing the sealed-beam lighting for the Mystic River Bridge, Boston, Mass., found the right answer in Simmons QUICK-LOCK.

Have you a similar fastening problem?



Unusual design by Taller & Cooper solves a number of problems in highway lighting. The engineers use a conventional sealed-beam headlamp mounted in an adjustable bracket. A cast bronze cover plate with integral visor is attached with three Simmons QUICK-LOCK fasteners to the housing which is part of the bridge structure. A rubber gasket seals the assembly.

Servicing is simple because QUICK-LOCK opens or locks with a 90-deg. turn. Inspection is easy because the stud is self-ejecting when it isn't locked. QUICK-LOCK keeps the gasket compressed tightly. The special head makes the unit tamper-proof. The fastener also resists vibration.

QUICK-LOCK can provide your design with unusual plusses, too. Simmons' engineers will be glad to study your fastening problems.

SIMMONS FASTENER CORPORATION
1749 North Broadway, Albany 1, New York

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I'M AWARE OF THE FACT THAT SCHRADER SUPPLIES OUR REPLACEMENT PARTS...

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Schrader business is built on the basis of complete service to the tire industry. That's why we must maintain a complete line—you require it of us! We want to help you make your tires give better service and last longer. That's why Schrader offers you the largest and most experienced research and manufacturing facilities.

Is the solution to your tire valve problem another new Schrader product?

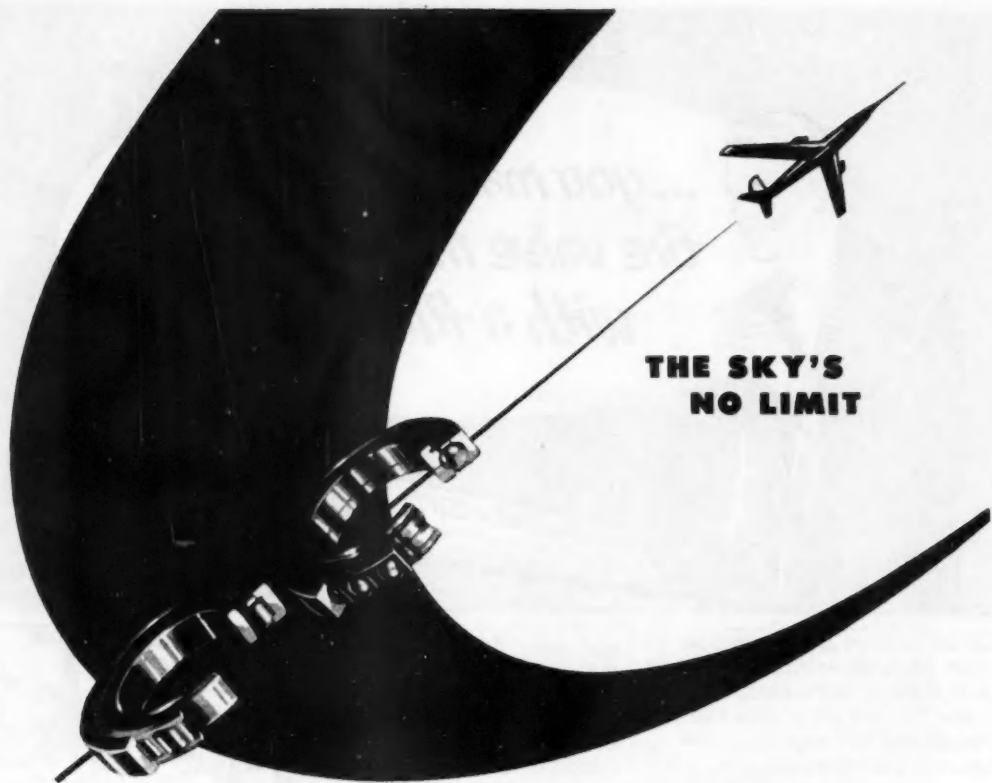
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NO LIMIT**

"Give me a place to stand and I'll move the earth." Archimedes meant, with a place to stand in the sky, he could pry the earth from its orbit. In Archimedes' day, the sky was the limit—but no more.

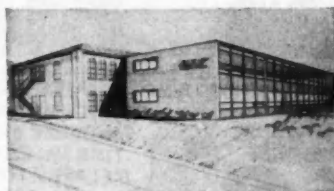
Men go farther and faster now than ever before, the sky's no limit, because progressive SKF bearing design coupled with proven manufacturing know-how assures reliable engine performance in today's rugged aircraft.

SKF intends to continue its four decades of close cooperation with the aviation industry, pioneering aviation's needs for new and improved bearing designs.

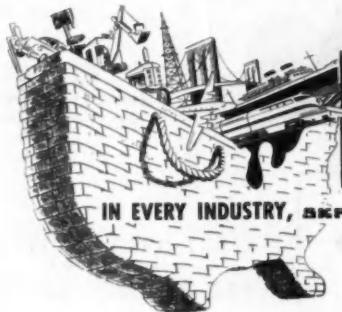
And will continue to provide every industry with eight good reasons for preferring SKF: Integrity, Craftsmanship, Metallurgy, Tolerance Control, Surface Finish, Product Uniformity, Engineering Service, Field Service.

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SKF INDUSTRIES, INC., PHILADELPHIA 32, PA. — manufacturers of SKF and HESS-BRIGHT bearings.



Anticipating aviation's demand for advanced bearing design—SKF is adding a wing to its Philadelphia Research Laboratory that will double its research facilities.

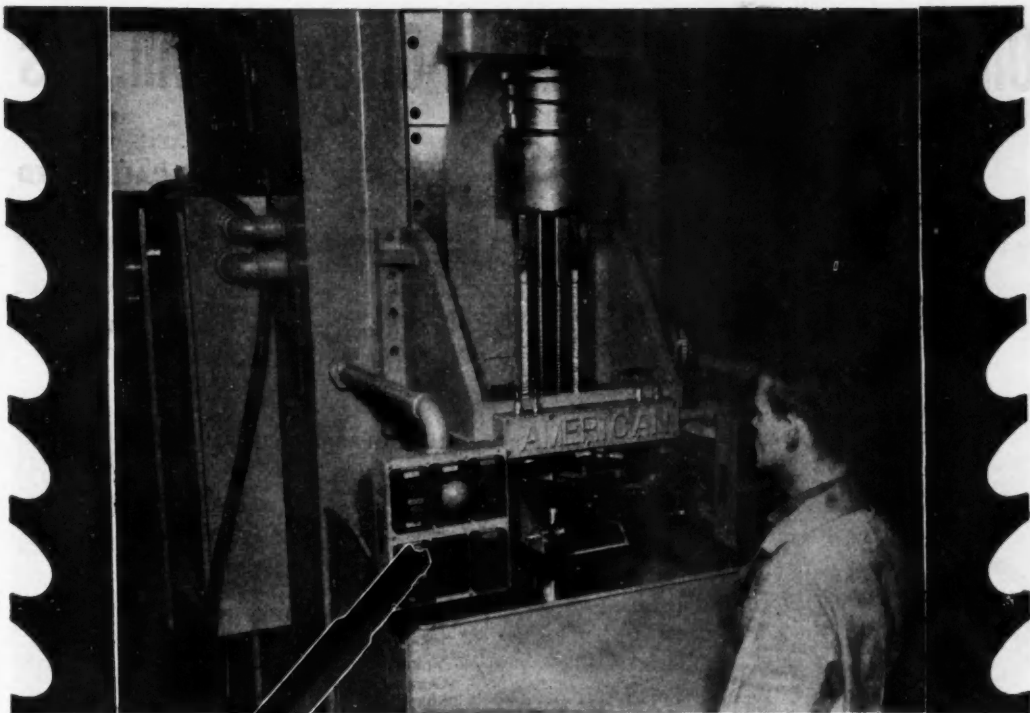


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Typical result engineered the *American* way

A special, large, American-engineered, automatic, six station pull head, on a standard American VP 3-10-30 Vertical broaching machine, helps to speed production on this automatic transmission part. A total of twelve angular sides, plus twenty-four corner radii are finish broached on 150 of these steel forged parts per hour. The machine is equipped with an American-engineered fixture with a manually operated work slide interlocked with the machine cycle for maximum safety.

Developing jobs of this type is an everyday occurrence at American Broach. Your broaching job benefits from the skill and experience of American engineers . . . engineers who design all three . . . broaches, broaching machines and broaching fixtures. Remember, the best way to do your job within cost and production requirements . . . is the American Way.

Write for our new Blue & Gold catalog containing complete machine specifications. Address Dept. A.



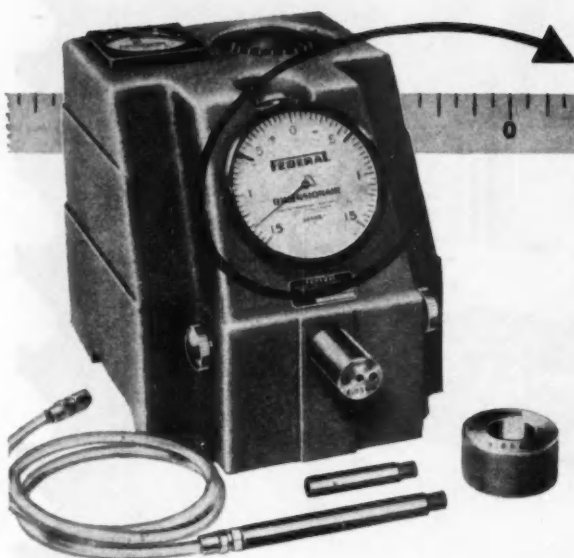
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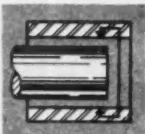


FULL 7½" SCALE OF CALIBRATED ACCURACY

**All of it measures accurately.
Not just part of it!**

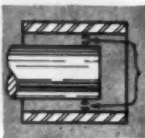
LONGER APPROACH RANGE

You measure earlier **BEFORE** reaching minimum work size. Less scrap. Same plug used on both rough and finished dimension. Total minus range .0015".



GREATER CLEARANCE (.0018" up to .0038")

You can read Undersize, Taper, Out-of-Round and Irregular Shape Holes without plug getting stuck. Easier to insert plug.



STAY-PUT ZERO — DON'T WORRY ABOUT PRESSURE FLUCTUATIONS

They do not affect accuracy. Set zero when you start—that's all. No drifting. Full Jeweled Cushioned Movement — more sensitive to size variations.



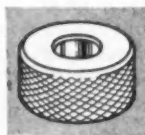
10 SECOND SET-UP — JUST ONE ADJUSTMENT

As simple as setting a Dial Indicator. Direct and Positive.



ONE MASTER ONLY — FORGET THE IDEA TWO ARE NEEDED

Only air gage with enough precision to permit use of only one master. Interchangeable plugs — every plug calibrates on same scale.



LONGER PLUG WEAR — JET FACES ARE DEEPER

Saves you real money.

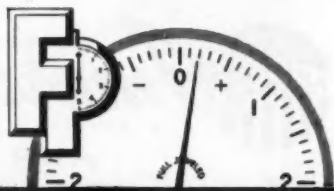


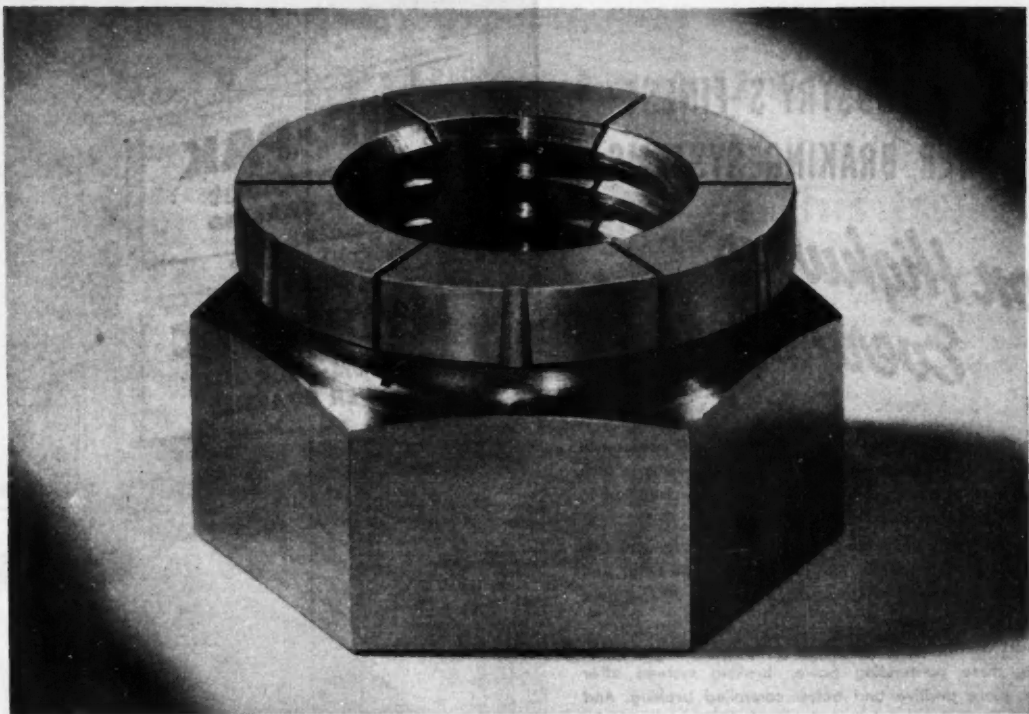
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Only the Dimensionair provides the many important features above. Customers who have given the Dimensionair a thorough trial have found its advantages outstanding and have ordered many Dimensionairs in large quantities, and repeatedly. We invite you to try the Federal Dimensionair and compare it with any other air gage. Ask our nearest representative or write today for complete information and prices. **FEDERAL PRODUCTS CORPORATION, 2610 Eddy Street, Providence 1, R. I.**

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Largest manufacturer devoted exclusively to designing and manufacturing all types of **DIMENSIONAL INDICATING GAGES**





ON COMMERCIAL CARRIERS FLEXLOC NUTS WON'T WORK LOOSE



SOUTHERN COACH LINES, Inc., Chattanooga, Tenn., uses FLEXLOC Locknuts to combat vibration on the motor housings, differentials, drive shafts and shock springs of its bus fleets.



PHILADELPHIA TRANSPORTATION COMPANY, Philadelphia, Pa., has installed FLEXLOC Self-Locking Nuts on the rear axle flanges of its buses. These locknuts eliminate sheared studs, reduce maintenance, save time and money.

Write for descriptive literature and samples. Although the Government has taken almost all of our output, we'll be glad to send as many as you need to test on your equipment. STANDARD PRESSED STEEL Co., Jenkintown 53, Pennsylvania.

FLEXLOC
LOCKNUT DIVISION

SPS
JENKINTOWN PENNSYLVANIA

THE INDUSTRY'S FINEST POWER BRAKING SYSTEMS

*on Highways
Everywhere!*

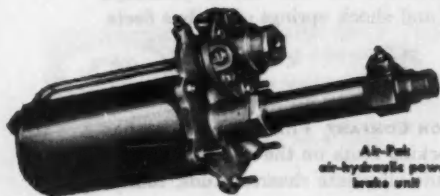
Regardless of the size of vehicle or whether the preference is for vacuum or air, the trucking industry has come to look to Bendix Products as the one source uniquely qualified to meet every power braking need.

Hydrovac, the world's most widely used power brake, is the undisputed leader in the vacuum-hydraulic field. And Air-Pak is recognized as foremost in the field of air-hydraulic power braking units.

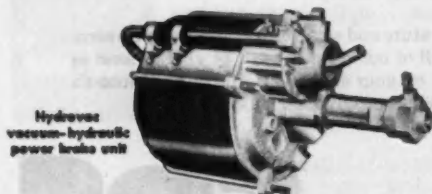
Products of twenty-five years of practical braking experience, these outstanding power braking systems offer faster, more positive and better controlled braking. And in both the vacuum and the air actuated units, brakes can be applied instantly by foot power alone—a constant safety factor of tremendous importance.

That's why on highways everywhere the preference is for Bendix Hydrovac® or Bendix Air-Pak, the Industry's Finest Power Braking Systems.

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Air-Pak
air-hydraulic power
brake unit

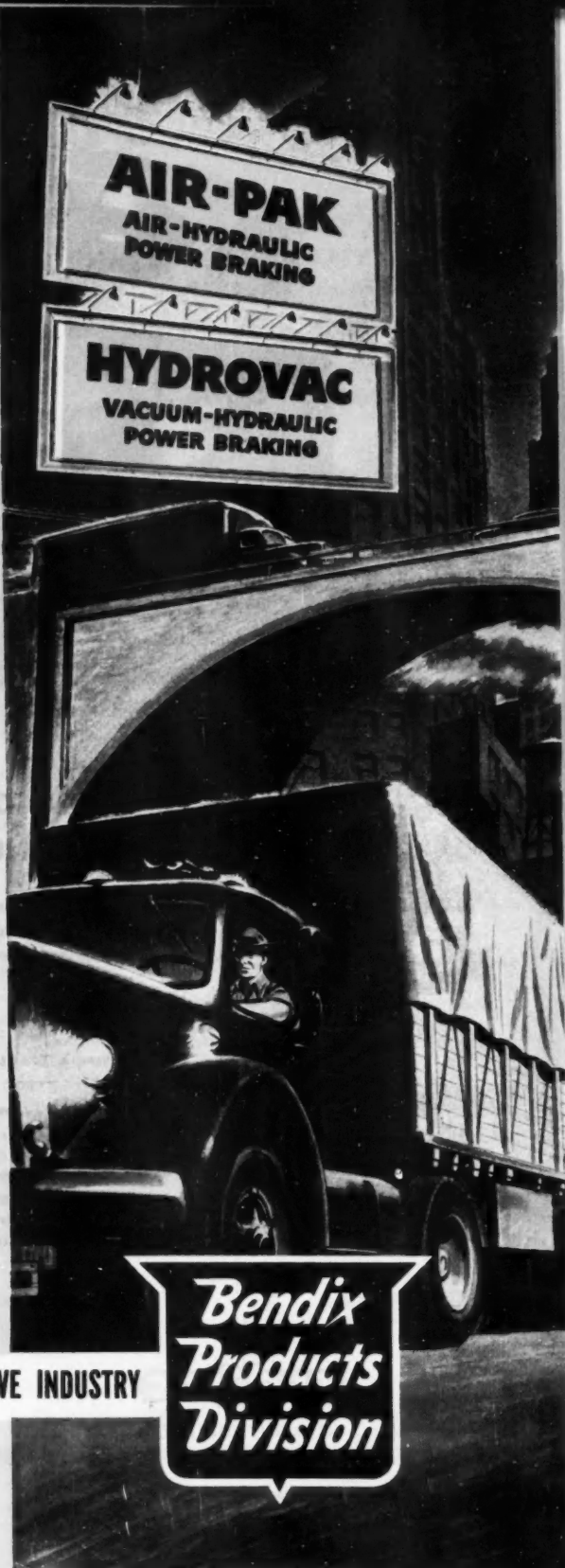
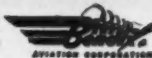


Hydrovac
vacuum-hydraulic
power brake unit

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High Spots of This Issue

★ Testing Machine Setups Duplicate Operating Conditions

The stresses and strains encountered by machines or materials in actual use are often difficult to simulate in the laboratory, but engineering ingenuity can accomplish wonders. Described here are typical setups used for various tests. Page 50.

★ Fabrication Methods for Aircraft Exhaust Systems

Ryan Aeronautical has increased output and curtailed space requirements for production of exhaust systems by bringing into play the perennially valuable assembly line technique. This article depicts the layout for flow type fabrication. Page 54.

★ Continuous Press Forging Applied to Crankshafts

Chrysler Corp.'s Dodge Forge Plant is now the proud possessor of an integrated line for the mechanical press forging of crankshafts. The author takes the reader on a tour of the plant that traces the forging process from start to finish. Page 58.

★ Simple Calorimeter for Measurement of Arc Energy

Developed for making direct and accurate measurements of arc energy, the calorimeter is an uncomplicated device whose use is not beset with the many variables found in combustion tests. Its design and operation are analyzed here. See Page 65.

★ Low Cost Blanking Dies for Light Gage Aircraft Parts

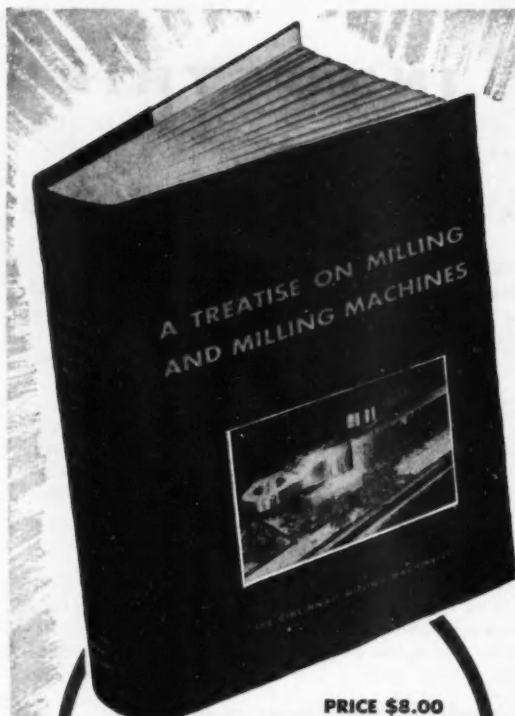
An inexpensive Class B blanking die, the pierce blank template (PBT), fits neatly into production techniques employed at Douglas Aircraft's El Segundo Div. as a valuable timesaver. The writer surveys a PBT from fabrication to completion. Page 66.

★ 24 New Product Items And Other High Spots, Such As:

Latest tractor developments; jet age problems; atomic energy reactor built at aircraft plant; fabrication methods for aircraft exhaust systems; making military truck bumperettes; how multiple nut runners save time; small two-stroke engines; testing landing gear; 50 years of Cadillac creations; four-speed transmission for torque converters; drawing heavy stampings; and special machine grinds tapered ellipse on pistons.

Automotive and Aviation News, Page 33
Complete Table of Contents, Page 3

AUTOMOTIVE INDUSTRIES COVERS
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES
• BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY •
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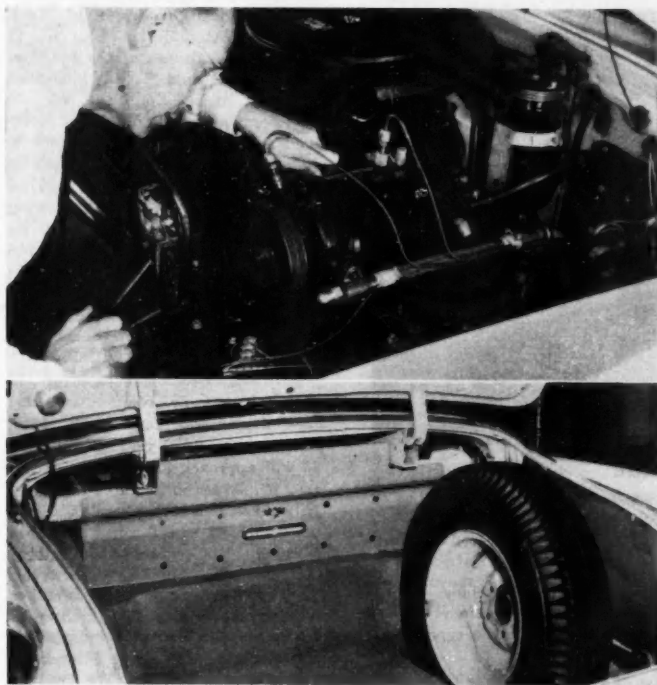
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News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 107, No. 7

October 1, 1952



AIR CONDITIONER

Frigidaire's new air conditioning unit for General Motors automobiles is shown installed on an Oldsmobile. The Freon pump runs directly off the engine; air blowers are electric. Cooling unit in the trunk behind the spare tire includes refrigerating coils and blowers. Further details had not been announced at press time.

Sears to Continue Sale of K-F Made Allstate

Sale of the Allstate automobile through Sears, Roebuck & Co. stores in 23 cities will be continued, according to a Sears statement. There had been some doubt that the large mail-order house would continue to merchandise the Kaiser-Frazer built car. However, a Sears spokesman says the car selling experiment is promising and that orders for a 1953 model al-

ready have been placed. It is reported that, whereas the current Henry J and Allstate are very similar in general appearance and specifications, the 1953 models will have more marked differences between them. Registration figures for the first seven months of this year show that 913 new Allstates were registered from the 23 Sears outlets compared with approximately 20,000 Henry J's sold by K-F dealers.

Hudson Shows Dealers, Press New Light Car

Hudson Motor Car Co. will begin production of its long awaited light car in November and will present it to the public before the end of this year.

The company showed the new car to its sales organization and the press in Detroit last month. Detailed specifications, however, still are secret as well as the name Hudson will give to the totally new car. It can be said, however, that Hudson has done a good job of building a compact light car weighing about 2800 lb with an engine rated at better than 100 hp. The horsepower to weight ratio will be about the same, or perhaps even a little better than that of the Hornet.

The car will have an in-line six-cyl engine with a 7.5-to-1 compression ratio and will use regular grade gasoline. Wheelbase was not announced, but visual calculation would place it somewhere between the shortest cars now being made and the Ford-Chevrolet-Plymouth range with which the car is to compete price-wise. Styling is completely new, with large glass areas and pleasing overall general appearance. It does not resemble any of the current Hudson lines but is of monocoque construction and retains the step-down principle. Interior of the body is designed to accommodate six passengers. Hudson officials make a great point of the car's inherent stability despite its light weight. They say it has been tested at more than 100 mph with no perceptible wander.

The car will be offered under several options to include standard and deluxe models, an aluminum cylinder head to give compression ratio of 8.1-to-1, a choice of standard transmission with or without overdrive, or Hydramatic transmission, and at least three different rear axle ratios. First models to come off the lines will be four-door sedans.

News of the AUTOMOTIVE



QUICK CHANGE

The new Willys-Overland Jeep for the Army carried two men and an 850-lb load up a 45-deg slope from a standing start, and was moving at about 10 mph when it reached the top. Ease of maintenance was demonstrated with a 14-min engine change at Aberdeen Proving Ground recently.

GM Merges Aeroproducts Division With Allison

General Motors Corp. has consolidated its aircraft engine and propeller operations by merging its Aeroproducts Div. at Dayton, O., with the Allison Div. at Indianapolis, Ind. Hereafter the Dayton operations will be known as Aeroproducts-Allison Div.

Under the consolidation, engineering developments of engines and propellers will be facilitated through closer liaison of engineering staffs, and joint use of test facilities of both divisions. It also is expected that a portion of Aeroproducts facilities will be used to make parts and sub-assemblies for Allison engines.

The two divisions have been co-operating closely on turbine engine propeller installations in military aircraft and in the Allison Turbo-Liner, the only U. S. commercial type trans-

port powered by turbine engines. Aeroproducts will continue development of more advanced type models.

Packard May Market New Light Diesel

Packard Motor Car Co. is in the engine building business to stay, according to James J. Nance, president. He told a meeting in Detroit that the new lightweight Diesel engines Packard is building for the Navy could be the prototype models for many other commercial applications. He reported that the company is on schedule with both its marine Diesel and jet aircraft engines.

The Packard Diesel develops one hp per five to six lb of weight compared with 15 to 20 lb per hp for conventional Diesels. Mr. Nance hinted that the development has considerable bearing on studies now under way for the company's automobile engines.

Sale of Le Roi Completed

Westinghouse Air Brake Co. has purchased a majority interest in Le Roi Co., according to a recent joint announcement by E. O. Boshell, president and board chairman of Westinghouse Air Brake Co.; W. C. Buchanan, chairman of the board of Le Roi Co.; and T. O. Liebscher, president of Le Roi. On Aug. 20 an offer was made to Le Roi stockholders to purchase common stock at \$9 per share and preferred stock at \$53.75 per share, provided 400,000 shares of the 576,000 outstanding shares of common stock were deposited by Sept. 15. Over 400,000 shares were so deposited and checks are being mailed immediately to the holders of these shares. The offer to buy stock at \$9 per share is being held open and continued to Oct. 15, 1952.

Le Roi Co., manufacturer of engines, portable compressors and rock drills, was founded in 1916. Sales for the fiscal year ending Sept. 30 will approach \$25 million. It has 1500 employees in its three divisions; Milwaukee, Wis.; Cleveland and Greenwich, O. Le Roi has developed a 200 hp, V-8 engine which Autocar Co. is using in a new truck. The Cleveland Rock Drill Div. has recently taken over the further development of a new type "continuous miner" machine from the Bituminous Coal Research Co., Inc. The Centaur Div. at Greenwich manufactures the "Tractair," a combination tractor and compressor. Le Roi Co. is heavily booked for defense orders; one is for its new "Siamese" twin V-8 Compressor, which is said to be of revolutionary design.

Cole Succeeds Ching as Mediation Head

David L. Cole, federal labor conciliation attorney, is the new head of the Federal Mediation Service. He succeeds Cyrus S. Ching, whose resignation becomes effective Sept. 30.

Cole served as chairman of the Wage Stabilization Board in 1950, and previously served on the New Jersey Mediation Board.

AND AVIATION INDUSTRIES

Survey Highlights Manpower Shortage

A problem of increasing importance to the automotive industries is the recent shortage of manpower. High up on the scarce list are engineers, draftsmen, tool makers, die-sinkers and setters, office workers, and in some areas even unskilled labor.

Skilled workers are being sought in nearly every state to fill 19,000 openings, according to the latest Government study. Machinists, 3300 of them, lead the list of requirements in California, Pennsylvania, Ohio, Illinois, and the District of Columbia. Thirty states have a demand for 2200 tool makers. In Connecticut, Ohio, New Jersey, and New York there are 1400 vacancies in machine shops and related lines.

Demand for workers is growing. The aircraft industry reports it will probably need at least 200,000 more in the next 17 months.

Government agencies are studying methods of getting better utilization of workers, such as through increased apprentice training. But employers of draft-eligible men are advised by the Defense Department to prepare for another big call-up in November. A general shortage of manpower is expected to continue for some time.

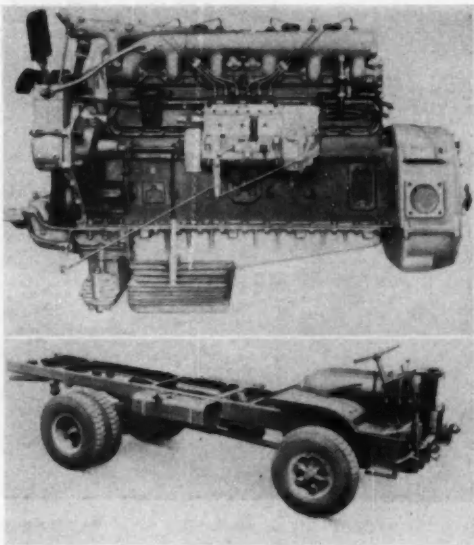
Pay increases for present workers are being watched closely by WSB. Firms wanting WSB to process requests for wage and fringe benefit adjustments in cases related to the basic steel settlement now must furnish complete information on WSB form 100. Employers also are finding they must be very specific in defining for WSB the reasons for giving an individual a merit or length of service pay increase.

Will Meet Goal

Despite the increasing manpower problems, chances for the automobile industry to meet its original goal of 4.3 to 4.4 million passenger cars this year appear to be good. In view of the rapidly improving materials situation, the industry is not unduly perturbed over a DPA pronouncement that the 1953 first-quarter industry

HEAVYWEIGHT

This new Fiat Diesel chassis will carry eight tons and pull an 18-ton three axle trailer. The single-cast, valve-in-head engine gives 140 hp. Same chassis is used for a 55 passenger bus.



allocation would be 1.150 million cars but with the amount of steel allotted to be only 60 per cent of the amount granted in the third quarter of this year. There is a growing feeling that the steel allotment question will be academic by the first quarter of next year and that adjustments will be made to permit the industry to get materials for its full production quota. NPA, itself, admits the difficulty of forecasting material supply several months in advance and apparently is setting allotments on the low side as a conservative measure.

Truck Plans

Tentative plans call for allocation of enough materials to permit production of 300,000 trucks and 15,000 trailers during first quarter 1953, or 1.2 million trucks and about 60,000 trailers for the full year. Truck manufacturers had asked for a first quarter rate of about 350,000 vehicles, not counting military orders and trucks for export. Officials say the supply situation is still too hazy to raise the presently allowed ceiling.

Whether truck production this year will reach the hoped for figure of

1 million units is still problematical. Last month it looked as if the steel strike may have pulled third quarter output back to less than 200,000 vehicles. And in mid-September, fourth quarter allocations were still on a basis of 285,000 vehicles for the final three months of 1952.

Hupp, Trico, Promote Window Lift Devices

Hupp Corp. reveals that it is negotiating with several automobile makers for installation of its all-electric push button window lifts on next year's models. The company's lifts now are used on Chrysler, Ford, Lincoln, and Mercury cars as an extra cost option. R. S. Geddes, Hupp president, said that his company's product is the only all-electric window lift adopted by the industry.

Trico Products Corp. has announced its air-operated window lift unit for adoption on new models. The company says that several automobile manufacturers are interested in the device. A spokesman says that the company is tooled up to go on a production manufacturing basis if orders materialize from the industry.

News of the AUTOMOTIVE



CONVERTIBLE

Convair 340 assembly at San Diego shows latest version, which can be converted by the operator from 44 to 56 seats. Takeoff weight remains 47,000 lb. About 180 are on order.

Industry Watching Fight On Exclusive Franchises

Automobile companies are evaluating possible effects on retail car dealerships of a Federal Trade Commission order banning exclusive franchises by Harley Davidson Motorcycle Co.

The FTC order enjoins Harley Davidson from making contracts with its dealers which forbid them to handle a competitor's products. The order also bars the company from enforcing any such contracts now existing on the sale and distribution of motorcycles, equipment, parts, accessories, and related products. If the order is allowed to stand through lack of appeal, or an adverse decision in the courts, it might have significant effects in the automobile industry which operates under exclusive franchises.

NPA to Reduce Tool Pooling Contracts

NPA, in the face of declining demand for machine tools for defense work, is tightening up on its pool contracts to machine tool builders. Under the pool arrangement, quantity orders of machine tools are placed in ad-

vance of their estimated need and thus are available to defense contractors when needed. The Government, in effect, guarantees to protect the tool builder from taking a loss if orders for the machines do not materialize.

Under its new policy NPA will scrutinize closely any new applications for pool contracts and will grant fewer of them as defense requirements taper off. Currently, there are about 120 such pool orders now in effect for about \$1.3 billion worth of tools and equipment.

Pan-American Race for Both Sport and Stock Cars

Rules for the third Mexican Pan-American Race, Nov. 19-23, provide for two classes of automobiles—sport or modified stock cars of unlimited size, and strictly stock closed cars.

The route has been increased to 2093 mi, across the length of Mexico. Total prize value has been increased to over \$85,000. Sport cars from many European countries are expected. The rules for stock cars virtually limit entries to sedans of American manufacture, according to race officials, and over 100 entrants are expected this year.

Alcoa Dedicates Plant; Stockpiling Postponed

The nation's newest aluminum producing unit built by Alcoa at Wenatchee, Wash., was dedicated last month. The \$45 million smelting works was formally dedicated by Alcoa's president, I. W. Wilson. It is located along the Columbia River, 13 mi south of Wenatchee. Capacity will be 170 million lb annually.

Although construction is not yet completed, the plant produced its first aluminum in late June. It is expected that the plant will be in full operation by early 1953.

Third-quarter aluminum production may be as much as 119 million lb below estimates because of power shortages in the Pacific Northwest. Drought in that area already has caused a loss of about 10 million lb of production.

"Interruptible power," which is bought chiefly by aluminum producers in the Pacific Northwest, was scheduled for complete black-out on Sept. 15.

Continued strong demand for aluminum by manufacturers of both military and civilian products is forcing the government to postpone its scheduled build-up of aluminum stockpiles.

NPA is now preparing to concur in industry recommendations that any resumption of aluminum stockpiling be deferred until first-quarter 1953—at the earliest.

Industry and the government anticipate an upturn in total output resulting from new productive capacity.

Autocar to Acquire Highway Trailer Co.

Autocar Co. is planning to acquire a majority stock interest of Highway Trailer Co. of Edgerton, Wis. Highway had sales of nearly \$12 million last year and has a large backlog of defense work. It is understood that Autocar would exchange 30,000 shares of its common stock for a controlling interest in the trailer firm. The company says that holdings of Atlas Corp. or Liberty Products Corp. in Highway Trailer will not be affected by the transaction.

AND AVIATION INDUSTRIES

Curtiss-Wright Announces Huge Turboprop

A new turboprop engine and an advanced series of propellers, which will provide long-range military aircraft with propeller-driven controllability and fuel economy at jet speeds, were revealed last month by the Curtiss-Wright Corp.

The new turboprop engine, which was said to be in an advanced state of development, is expected to dwarf in power any aircraft engine yet made public.

The new propellers, designated the Turboelectric series, are capable of harnessing power outputs up to 20,000 hp and more, and will, the company anticipated, pave the way for the eventual attainment of speeds up to 1000 mph. Included in the series are models designed for use with the new Wright turboprop, the Allison T-38 and T-40 models, and the P&W T-34.

Some models of the new propellers range up to almost 20 ft in diameter. They are of the three-and-four-bladed, single rotation, and six- and eight-bladed, dual rotation, types. Blades are hollow-steel, produced by a new extrusion process perfected by Curtiss-Wright in cooperation with the Air Force.

Precision Castings Co. Buys Bradley-Edlund

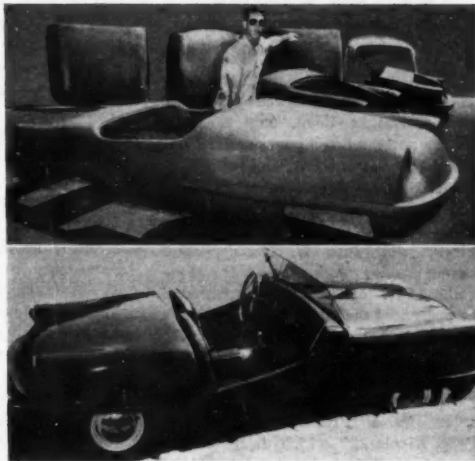
Precision Castings Co. of Fayetteville, N. Y., has acquired the Bradley-Edlund Corp. of Cortland, N. Y., through a stock exchange. Acquisition of the company will give Precision Castings greatly increased capacity for production of dies, tools, fixtures and general purpose machinery. Bradley-Edlund will continue to manufacture drilling and tapping machines, special purpose machinery, and forging hammers.

AC&F Forms Aircraft Unit

American Car & Foundry Co. has formed an aircraft division with headquarters at St. Charles, Mo. Principal activity of the new unit will be production of fuselage sections for the B-47 stratojet bomber.

SKORPION

This plastic body weighs only 150 lb. Deluxe kit, top, has hinged doors. Standard model, below, is mounted on a Crosley chassis, sells for \$460 in California.



Thompson Reopens Plant for Ball Joint Output

Interest by several automobile manufacturers in its new ball joint front wheel suspension has prompted Thompson Products, Inc., to reactivate its idle plant at Fruitport, Mich., near Muskegon. The plant has been down since last year, when piston ring manufacture was transferred to St. Louis by Thompson, to a plant acquired two years ago when it bought Ramsey Corp. The ball joint suspension is used on Lincoln and Mercury cars.

DD Cites Dean's Problems

Specific production problems on which the Defense Department intends to focus its attention include the improvement of traversing gear on certain tanks, expediting of machine tool output, and phasing of item deliveries so as to insure that all components of pieces of complex equipment will be ready for use at a given time.

These tasks were cited by Defense Secretary Robert Lovett recently as being under the jurisdiction of Hugh Dean, former General Motors Corp. executive who has replaced Clay Bedford as production expeditor for the military forces. The secretary said

Mr. Dean, as the "focal point" for all manufacturing questions, will work closely with his (Lovett's) office and with the Munitions Board.

From now on, Mr. Lovett stated, results of the previous tooling-up period in defense production can be viewed optimistically. He declined to say, however, that he is satisfied with the delivery rate for military goods, particularly in the hard goods field.

Toughest problem confronting his department now, according to Mr. Lovett, is the probable effect of the steel strike on production of such general items as nuts and bolts, which are not usually described as military materials. Despite lack of priorities for these articles, their importance will be felt if in future months their absence will lead to delays in equipment deliveries.

Kelsey-Hayes President Added to Bowers Board

Directors of Bower Roller Bearing Co. have elected George W. Kennedy, president of Kelsey-Hayes Wheel Co., to the board of directors. The board also promoted R. S. Strickland, formerly sales vice-president, to executive vice-president and elevated F. E. Halderman, treasurer, to the additional office of vice-president.

News of the AUTOMOTIVE

Turbo-Prop Paper Wins Manly Memorial Award

The Manly Memorial Medal, one of America's highest engineering honors, will be bestowed upon two Curtiss-Wright Corp. engineers for their outstanding contributions to aircraft turbine-propeller development, it was announced recently by the SAE, sponsor of the award.

Joseph M. Mergen, chief design engineer, and Jack H. Kasley, chief aerodynamics engineer, of the Propeller Div. of Curtiss-Wright, will be presented the medal at the Society's National Aeronautic Meeting to be held in Los Angeles, Oct. 1-4. Mergen and Kasley achieved the Manly Medal with their technical paper on "Characteristics of Propellers for Turbo-Prop Airplanes" which discusses the important design phases of combined turbine-propeller and engine controls and factors affecting the structural integrity of the propeller.

Marman Completes Expansion

Marman Products Co., Inc., recently completed a \$1 million expansion at 11214 Exposition Blvd., W. Los Angeles, Calif. The original plant will continue in operation at its present location in Inglewood. Increased demand for the company's line of engineered clamps, straps and couplings is given as the reason for the expanded facilities.

Controls Maker Moves

Control Engineering Corp., formerly of Canton, Mass., has com-

menced operations in its new enlarged headquarters at 560 Providence Highway, Norwood, Mass. Special pressurized temperature-controlled areas, in which all air is pre-cleaned with electro-static precipitators, are included to facilitate assembly of their line of precision gyroscopes and Microsyns.

Parts Plant Closed

Spicer Manufacturing Div. of the Dana Corp. announced the closing of its auto parts plant at Pottstown, Pa., which employs approximately 1950. A spokesman said high cost of production in the local plant was the reason for the shutdown. The plant has operated there since 1919. Local plant equipment will be distributed to other Spicer locations.

Rivet Firm Adds Western Affiliate

Purchase of the Pacific Rivet & Machine Co., Alhambra, Calif., has been announced by the Milford Rivet & Machine Co., Milford, Conn., manufacturers of tubular and split rivets, cold-headed fasteners, and rivet-setting machines. This brings to five the number of plants owned and operated by the Milford company.

Present management and personnel of the newly acquired company will be retained and will be known as the Milford Rivet & Machine Co. Pacific Div., according to the announcement. The plant manufactures tubular rivets, cold-headed specialties and rivet-setting machines.

I-H Truck Division Opens Laboratory

Late last month the International Harvester Co. dedicated the new engineering, test, and research laboratory facilities of its motor truck division, recently completed at Fort Wayne, Ind. Stemming from intensive work during the past two years, this engineering plant contains many unique features and has been designed to provide the most modern facilities and physical arrangement for motor truck engineering, research, and testing.

Continental Foundry Gets Tank Hull Job

Continental Foundry and Machine Co. has been awarded a Government contract for hull assemblies amounting to more than \$11.2 million. Other awards by the Chicago Ordnance District include a \$5.3 million order to International Harvester Co. for shells and an order for automotive spare parts to Diamond T Motor Car Co. in the amount of \$87,924.

Modern Fuse Plant

Littelfuse, Inc., manufacturer of fuses since 1927, is now occupying its new plant at 1865 Miner Street, Des Plaines, Ill. The new one-story brick building is organized for high efficiency in the flow of raw materials to finished products. The firm attributes a great part of its 25-year success story to tightly maintained quality and production control.

REGIONAL SALES OF NEW PASSENGER CARS

Zone	Region	July		June		July		Seven Months		Per Cent Change		
		1952	1951	1952	1951	1952	1951	1952	1951	July over June	July over July 1951	Seven Months 1952 over 1951
1	New England	17,535	25,336	23,167	143,686	185,800	-30.79	-24.31	-22.67			
2	Middle Atlantic	70,631	80,776	77,295	474,167	612,656	-12.56	-8.62	-22.63			
3	South Atlantic	39,183	80,884	46,538	286,686	379,101	-22.96	-15.96	-22.01			
4	East North Central	82,507	107,768	108,306	633,995	638,962	-23.44	-23.82	-24.44			
5	East South Central	12,924	19,839	18,223	112,906	146,257	-34.19	-31.70	-23.64			
6	West North Central	32,983	42,547	41,933	248,251	333,803	-22.40	-21.38	-26.53			
7	West South Central	37,134	26,519	35,561	227,244	276,510	+1.66	+4.42	-10.79			
8	Mountain	11,585	15,393	14,047	83,613	107,296	-24.67	-17.67	-22.07			
9	Pacific	35,972	44,790	40,441	263,911	329,044	-19.69	-11.05	-19.79			
Total—United States		340,454	423,655	408,333	2,490,329	3,214,919	-19.64	-16.21	-22.85			

States comprising the various regions are: Zone 1: Conn., Me., Mass., N. H., R. I., Vt.; Zone 2: N. J., N. Y., Pa.; Zone 3: Del., D. C., Fla., Ga., Md., N. C., S. C., Va., W. Va.; Zone 4: Ill., Ind., Mich., Ohio, Wis.; Zone 5: Ala., Ky.,

Miss., Tenn.; Zone 6: Iowa, Kan., Minn., Mo., N. D., S. D.; Zone 7: Ark., La., Okla., Tex.; Zone 8: Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo.; Zone 9: Cal., Ore., Wash.

AND AVIATION INDUSTRIES

Fisher Body Building Pumps for T-48 Tank

Fisher Body Div. of General Motors Corp. revealed that it has gone into production of hand operated hydraulic pumps for the cannon for the T-48 medium tank.

The job was given to Flint plant No. 1 and the first pump was produced within six months and accepted by the Army. Tooling now has been completed for volume production.

The pump weighs 14 lb and has 61 separate parts. Final hand-fitting of parts is required, since tolerances run to the millionth of an inch. The Flint plant will supply all needs of the Grand Blanc, Mich., tank plant plus a reserve supply for tanks built elsewhere.

Chrysler, Caterpillar Make Safety Records

Apparently intensive programs on industrial safety are profitable for automotive firms. Chrysler Corp. reports that its safety record was 22 per cent better during the first six months of this year than for all of last year. Its record of only 3.9 lost time accidents per million man-hours was substantially better than the accident rate last year for the entire automobile industry, or for all industry. Not only was the number of

accidents reduced, but the severity rate showed a reduction of 38.8 per cent from last year.

Caterpillar Tractor Co. reports that its first six months safety record indicates the safest year in history for the company this year. Accident frequency for the first six months was 2.81 per million man-hours of work, with May the lowest in history at 1.98 cases.

Canadian Plane Plant Expansion Opened

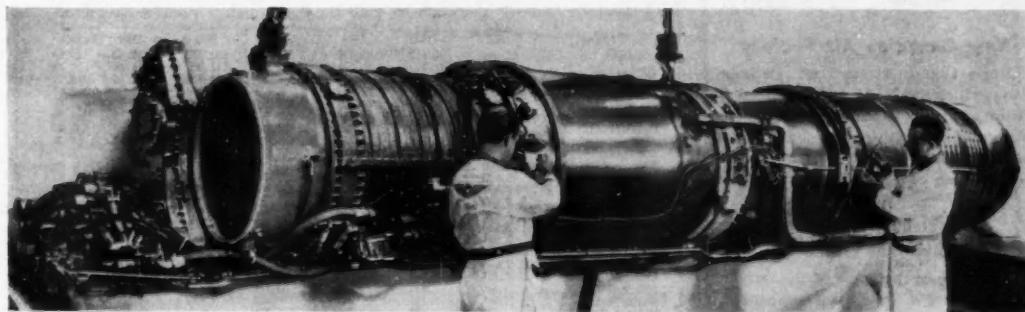
A \$750,000 extension of the assembly line of Fairley Aviation Co. of Canada, Ltd., was officially opened at Halifax, N. S., recently. The extension nearly doubled the plant's facilities for assembling and overhauling Navy fighter planes and four-engine Lancaster bombers.

1952 NEW TRUCK REGISTRATIONS*

Arranged by Makes in Descending Order According to the 1952 Seven Months' Totals

SEVEN MONTHS						
MAKE	July 1952	June 1952	July 1951	Units		Per Cent of Total
				1952	1951	1952 1951
Chevrolet	22,908	25,482	32,403	167,114	214,334	33.34 35.79
Ford	18,301	18,882	20,240	106,870	148,305	22.89 24.72
Dodge	16,169	8,829	8,448	87,817	63,688	12.21 10.61
International	8,754	7,565	8,085	52,961	53,248	11.39 9.87
G. M. C.	7,238	6,808	8,310	46,192	60,034	9.81 10.00
Studebaker	2,776	2,584	2,604	17,008	18,144	3.61 3.02
White	976	988	966	6,537	7,730	1.39 1.29
Willys Truck	1,018	977	1,044	6,316	9,146	1.34 1.82
Willys Jeep	674	686	760	4,772	6,349	1.61 .87
Mack	646	606	707	4,232	6,503	.90 1.06
Diamond T	296	224	383	2,070	2,882	.44 .48
Rio	277	268	238	1,804	2,240	.38 .37
Divee	206	216	294	1,738	2,461	.37 .48
Brockway	132	101	142	934	1,468	.20 .24
Autocar	125	129	171	824	1,332	.20 .22
Federal	108	87	82	800	886	.11 .11
Konwarth	90	42	84	401	421	.09 .07
Pontiac	39	41	98	325	482	.07 .06
F. W. D.	44	29	38	306	288	.06 .05
Sterling	14	16	33	143	221	.03 .04
Peterbilt	21	29	25	139	168	.03 .03
Misc. Domestic	181	181	94	1,386	886	.29 .18
Misc. Foreign	12	10	18	183	139	.04 .02
Total—All Makes	72,134	71,471	84,021	471,086	599,986	100.00 100.00

* Based on data from R. L. Polk & Co.



NEW J-40 IN PRODUCTION

Latest version of the Westinghouse J-40 turboprop engine to pass the 150-hr military qualification test, the model above is described by the Navy and W-E as developing thrust "equivalent to 25,000 hp at flight speeds" with afterburner. It provides constant speed drive for accessories, will power the F3H and F4D.

Production of the new J-40 by next summer is scheduled for the Lincoln-Mercury plant under construction at Romulus, Mich. Tooling has started at Wayne, Mich., where about one-quarter of the 1.3 million sq ft of floor space will be devoted to parts and assemblies. Westinghouse is now in production at Philadelphia, Pa.

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Hot Rod Sets Speed Mark

A hot-rod Ford with two engines last month streaked over the Bonneville salt flats, Utah, at 250 mph to a new unofficial hot-rod world speed record. The car, owned by Bill Kenz, Denver, Colo., was entered in the Class D competition at the Bonneville National Speed Trials, the World Series of hot-rodding.

The Maremont Trophy for automotive engineering went to George Hill and William Davis, both of Burbank, Calif., for their V-8 powered Class C streamliner hot rod. Hill drove this car and demonstrated its safety when the car blew a tire at 230 mph and stayed on course to beat the international record held for 15 years by the Auto Union company of Germany. His two-way average was 229.24 mph.

Allied Products Plant Addition Completed

Allied Products Corp., Detroit, has completed a 30,000 sq ft addition to its precision parts plant at Hillsdale, Mich. The plant is used principally for production of parts for jet and piston aircraft engines. It's normal peace-time activity would be production of hardened and precision-ground parts, including interchangeable punches and dies.

New Canadian Air Factory

DeHavilland Aircraft of Canada, Ltd., will build a \$4 million aircraft factory at an R.C.A.F. base near Toronto, Ont., it was announced recently. The new factory will contain seven acres of floor space.

Detroit Firm Changes Name

A change in the name of the Detroit Lubricator Co. has been announced. Hereafter, the company will be known as the Detroit Controls Corp.

There will be no change in operating personnel, and the company will continue as a division of the American Radiator & Standard Sanitary Corp. The company manufactures

automatic controls for refrigeration, air conditioning and heating as well as temperature and pressure controls for the aviation, marine, transportation and appliance industries.

Houde Name Changed

Houdaille-Hershey Corp. has changed the identity of its Houde Engineering Div. to the Buffalo Div. The old name dated back to 1919 and the beginning of the Houde Engineering Corp. Houdaille-Hershey acquired the Houde Corp. in 1928. Houdaille-Hershey has spent more than \$2 million for equipment, modernization and expansion at the plant since the end of World War II.

Eaton Expands Again

Eaton Manufacturing Co. announced recently an additional expansion program at its pump division, Marshall, Mich., of about \$750,000 to meet increased military and power steering requirements for the Eaton rotor pump. This expenditure is principally for equipment and tooling.

Early this year 37,000 sq ft of manufacturing space was added to the Marshall plant which, in addition to equipment, cost \$1.3 million. This expansion is virtually complete and the new building is in production. The two programs will result in the doubling of the plant's capacity.

Seven Months' Retail Car Sales Valued at \$5,181,000,000*

Price Group	July 1952				Seven Months 1952			
	Sales	Dollar Volume	Units†	% of Total	Sales	Dollar Volume	Units†	% of Total
Under \$2,000	164,838	48.84	5282,849,689	40.44	1,292,242	52.48	\$2,282,182,632	44.06
\$2,001 to \$2,500	101,093	30.19	225,401,467	31.12	791,475	30.90	1,665,616,464	32.14
\$2,501 to \$3,000	53,405	15.63	142,740,189	19.71	317,013	12.87	857,134,626	16.54
Over \$3,000	17,339	5.14	63,256,932	8.73	102,832	4.17	379,898,669	7.27
Total	337,468	100.00	\$724,247,378	100.00	2,483,562	100.00	\$5,181,782,291	100.00

*—Calculated on basis of new car registrations, as reported by H. L. Polk & Co., in conjunction with advertised delivered price at factory of four door sedan or equivalent model. Does not include transportation charges or extra equipment.

†—New registrations of American made cars only. Does not include imported foreign cars.

1952 NEW PASSENGER CAR REGISTRATIONS*

Arranged by Makes in Descending Order According to the 1952 Seven Months' Totals

MAKE	SEVEN MONTHS				Units				Per Cent of Total	
	July 1952	June 1952	July 1951		1952	1951	1952	1951		
Chevrolet	62,690	95,052	85,979		509,826	691,672	26.52	21.50		
Ford	47,104	68,012	86,096		401,951	553,882	16.21	17.23		
Plymouth	41,361	46,968	48,836		276,716	352,233	11.16	10.90		
Buick	24,083	30,474	30,735		196,332	251,796	7.61	7.63		
Dodge	26,589	31,344	24,313		190,868	182,291	6.31	5.67		
Pontiac	21,279	27,642	27,268		159,667	212,066	5.29	6.60		
Oldsmobile	17,307	21,650	22,167		131,677	175,180	5.29	6.45		
Mercury	14,311	18,696	18,253		103,974	146,827	4.19	4.56		
Studebaker	11,834	15,527	15,614		101,622	121,240	4.10	3.77		
Nash	14,492	16,769	11,719		95,748	78,771	3.40	2.45		
Chrysler	10,645	11,002	11,921		72,363	99,000	2.92	3.06		
De Soto	8,197	8,672	9,007		66,806	67,785	2.25	2.11		
Cadillac	7,944	8,301	7,622		49,961	56,878	2.01	1.83		
Hudson	7,906	8,300	6,860		46,276	64,462	1.86	2.01		
Packard	7,234	7,583	6,106		42,543	41,706	1.72	1.30		
Kaiser	3,994	3,951	3,980		23,791	34,937	.90	1.09		
Willis	4,653	4,414	2,835		22,377	16,954	.80	.51		
Henry J.	14,675	4,035	3,577		26,161	34,666	.84	1.06		
Lincoln	2,737	2,807	1,710		15,213	16,420	.61	.48		
MG (British)	806	831			4,118		.17			
Austin (British)	431	413	214		2,954	1,965	.12	.06		
Hillman (British)	483	428			2,579		.10			
Crosley	310	323	393		2,185	3,458	.09	.11		
Ford (British)	337	332	294		2,142	1,767	.09	.06		
Jaguar (British)	264	296			1,601		.06			
All State	175	171			613		.04			
Misc. Domestic	21	24	206		681	1,244	.03	.04		
Misc. Foreign	461	380	1,024		2,509	7,255	.10	.23		
Total—All Makes	346,454	423,605	406,333		2,480,329	3,214,919	100.00	100.00		

* Based on data from R. L. Polk & Co.

Men in the News

Current Personnel Appointments and Changes at Plants of Automotive Manufacturers and Their Suppliers

Federal Motor Truck Co.—Earle W. Winans has been made director of product engineering to handle military contracts.



Bulldog Electric Products Co.—John B. Cetaldo has joined the firm as director of research and development.



Plymouth Motor Corp.—R. C. Somerville, general sales manager, was elected a vice president and a board member recently.



Lockheed Aircraft Corp.—In a major management realignment, Courtlandt S. Gross becomes executive vice president of the entire Lockheed Corp. Burt C. Monesmith was advanced to vice president and general manager, California Div. The management policy committee was expanded with addition of Hall L. Hibbard, vice president, engineering. Vice president Carl B. Squier will be assistant to the president.



Rinshed-Mason Co.—William R. Barrett was raised to vice president and manager of the Detroit plant.



American Car and Foundry Co.—Clifford W. Spensel is now vice president in charge of the new Aircraft Div.

General Motors Corp.—Henry C. Botsford has been named in charge of the advertising department of the sales section.

Fairchild Engine & Airplane Corp.—T. D. Ellison has been appointed comptroller of the Guided Missiles Div.

Chrysler Corp.—Appointments to production and planning staffs of the Detroit Tank Plant were announced as follows: William M. Williams, superintendent of planning, and O. W. Olson, traffic supervisor.

B. F. Goodrich Co.—Elmer A. Stevens has become treasurer, according to a recent announcement.

Ford Motor Co.—Appointment of Thomas J. O'Neil as director of the product sales and dealer organization planning office of the company's sales and advertising staff was announced recently.

Pontiac Motor Div., General Motors Corp.—Howard E. Crawford has been appointed general sales manager.

E. I. duPont de Nemours & Co., Inc.—Frank H. Beadles has been named assistant director of sales of the Finishes Div.

Chrysler Corp.—Promotion of Anthony O. Maloney to factory manager of the Lynch Road plant has been announced.

Rinshed-Mason Co.—Joseph R. Mason has been appointed vice president of the company and manager of the Automotive Refinishing Div.

Murray Corp. of America—Roger M. Dailey has become secretary-treasurer and a director of the company.

Cummins Engine Co., Inc.—Promotion of J. C. Miller to executive engineer in charge of product engineering and research activities has been announced.

Carborundum Co.—Harry C. Martin has been elected a vice president.

Chevrolet Motor Div., General Motors Corp.—E. F. Gormsen has been appointed director of purchases. K. E. Staley was named assistant general sales manager of the western states.

Aeroproducts Div., General Motors Corp.—Appointment of James F. Chaff as assistant factory manager has been announced.

General Tire & Rubber Co.—Robert Moran has been named manager, special purpose tire department.

(Turn to page 134, please)

Necrology

Richard W. Jackson, 40, a vice-president of Hudson Motor Car Co., died at Grosse Pointe Shores, Mich., on Sept. 11.

Harlan G. Newcomer, 77, a former president of the National Implement and Vehicle Manufacturers Association, died Sept. 20, in Utica, N. Y.

William B. Smith, 47, former manager of the Chester, Pa., Ford Motor Co., plant, died at Lansdowne, Pa., Sept. 12.

Walter L. Carter, 67, who formed the Carter Motor Car Co. in 1909, and was an automotive specialist with the WPB in World War II, died at his home in Washington, D. C., Aug. 30.

George T. Emerson, 57, executive and Detroit editor of *Motor Magazine*, died at Detroit, Mich., Sept. 9.

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- ... Improve Appearance
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- ... Obtain Higher Strength to Weight Ratio



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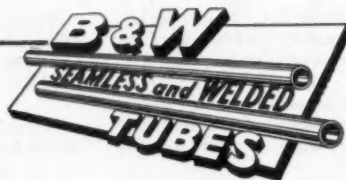
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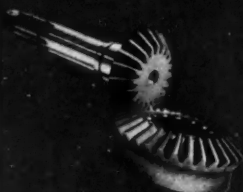
TA-1409M



SPIRAL BEVEL GEARS



HYPOID BEVEL GEARS



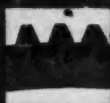
ZEROL BEVEL GEARS



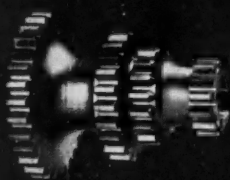
STRAIGHT BEVEL GEARS



ANGULAR BEVEL GEARS



FLYWHEEL RING GEARS



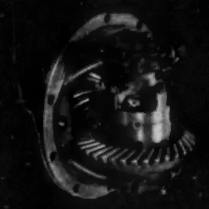
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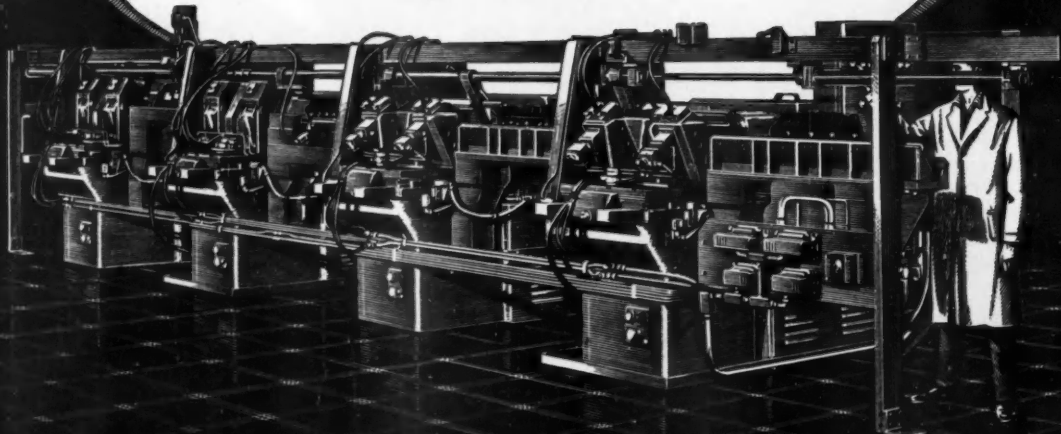


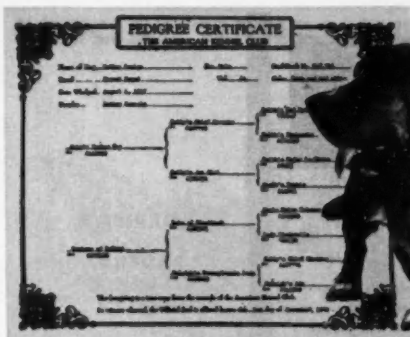
*What names come to your mind
when you think of
progressive manufacturing?*

MOST of the ones you think of first have bought New Britain Automatics within the past few years for new and better ways of doing important metalworking jobs. The New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Conn.

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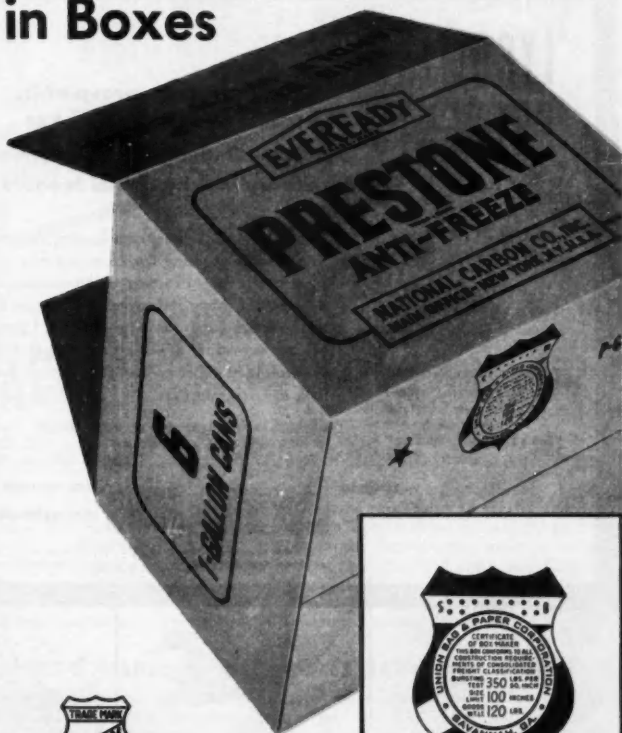
"Pedigree" is a Fancy Name for "Quality" ... in Bassets or in Boxes

AND in both cases, it's earned by knowing and controlling every step in development, right up to the finished article.

UNION traces the ancestry of its corrugated containers all the way back to Union-owned forests . . . controlled through every step of manufacture in Union mills (largest in the world) and right up to the shipping of Union boxes to your plant.

That earns a pedigree for Union boxes, because you *know* you can depend on every shipment being up to the same high standards. You can reduce breakage, pilferage, returns.

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Dependable Packaging Since 1874



UNION Corrugated Containers

UNION BAG & Paper Corporation

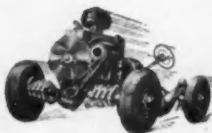
Principal Offices: WOOLWORTH BLDG., NEW YORK 7, N. Y.

Corrugated Container Plants: SAVANNAH, GEORGIA • CHICAGO, ILLINOIS • TRENTON, NEW JERSEY



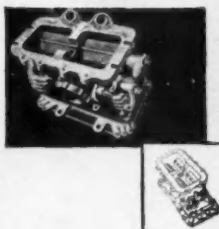
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grit its teeth?

When this helicopter's
giant blade spins, tiny
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carry the load!



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Here, through the eyes of a leading American
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AIR-COOLED ENGINES FOR AIRCRAFT AND INDUSTRIAL USES • PRECISION-AND-
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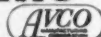
LOOK TO

LYCOMING

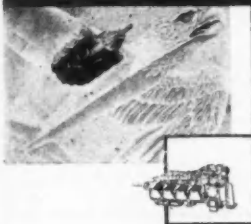
FOR RESEARCH

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LYCOMING-SPENCER DIVISION
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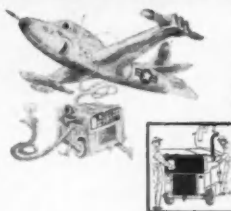


WILLIAMSPORT, PA.
STRATFORD, CONN.



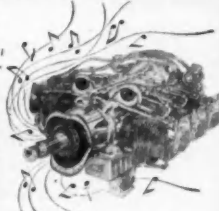
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Ready reserve power is an
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400-horsepower air-cooled
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This light, compact,
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Its "song" fills the air

For dependable air-cooled
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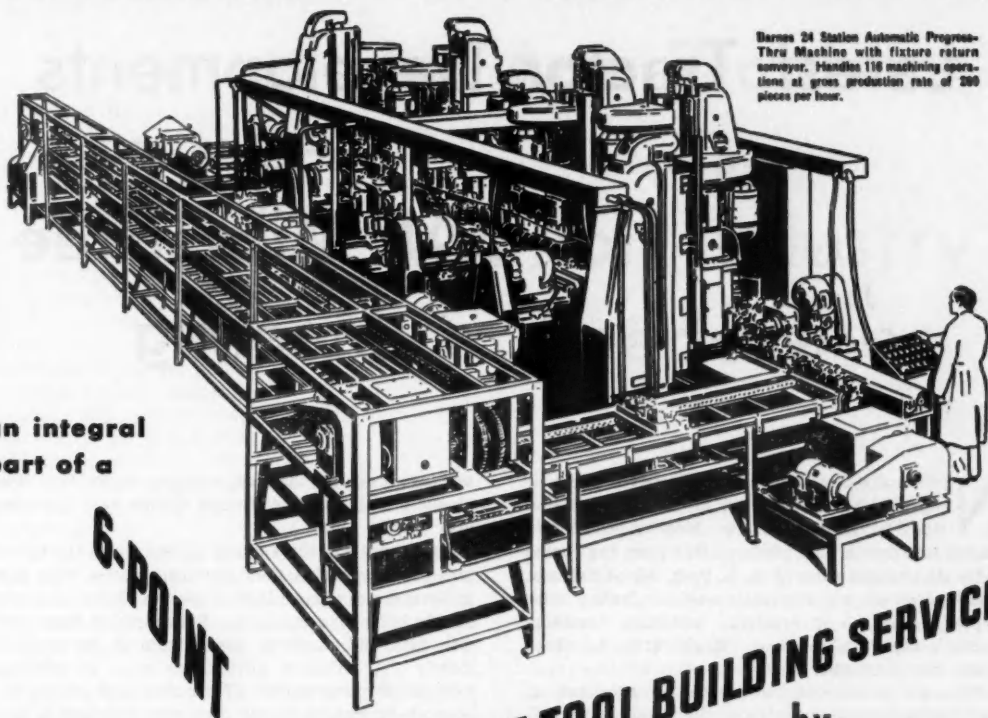
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Latest Tractor Developments

Discussed at

SAE Milwaukee Meeting

By
Joseph
Geschelin

Now firmly established in SAE circles, the Production Forum was one of the highlights of the SAE National Tractor Meeting held in Milwaukee last month. As produced this year, the Forum under the chairmanship of M. L. Frey, Allis-Chalmers, consisted of six simultaneous sessions dealing with forging, gears, heat treating, materials handling, quality control, and welding. Registration for these panels was about 300.

Although in general the techniques discussed at these sessions were conventional, the principle of audience participation was instrumental in a mutual exchange of information and a friendly analysis of problems and questions raised by participants. Moreover, the sessions at this meeting brought out strongly the inter-relation between the production process and the designer, thus bringing to the fore the need for cooperation between the two branches of activity.

It appeared likely that the Production Forum is destined to become a regular feature of the annual Tractor Meeting in Milwaukee.

At the technical sessions sponsored by the Tractor and Farm Machinery Activity, F. M. Ison, Saginaw Steering Gear Div., GMC, proposed the adoption of power steering on farm tractors. From a sales standpoint he stressed the element of comfort as well as increased efficiency in the operation of wheeled tractors which are estimated to be driven about 634 hours a year, on the average. Improved efficiency, resulting from less physical effort and decreased fatigue should mean higher output per man-hours of work and more total hours of work. These advantages, coupled with safer operation, should make power steering attractive, in the opinion of the author.

Results of actual field tests conducted recently on off-highway trucks, earthmoving equipment, and ore hauling operations, to determine the comparative merits of standard or conventional power trains and hydraulic torque converter drives were presented by R. M. Schaefer and J. A. Winter, Allison Division, GMC. Operators cooperated in this test program by

making available identical vehicles using both mechanical and torque converter drives and operating over similar routes.

Supplementing the analysis of test data, the operators made available their service records, thus permitting direct comparison of the two types of drives on the basis of actual life. Summarizing these service data, the converter power train shows approximately the following advantages over conventional mechanical power trains: 47 per cent more engine life between overhauls; 93 per cent more differential life; almost four times transmission life.

Supported by test data as well as available maintenance records, the author reaches the following conclusions, subject to further verification:

1. That the torque converter eliminates shock loading when starting; also eliminates stress variations caused by torsionals and resonance.

2. Consequently, it is possible to employ higher design stresses in hydraulic transmission parts; feasible to use higher loading; or to obtain longer life for equal loading.

Mr. Schaefer highlighted the test results to show the three principal classes of loads imposed on power train components that affect their life.

1. Starting loads in both converter and mechanical units. Here the mechanical unit experiences shock loads on starting, their magnitude being greater than the maximum observed stall load of the torque converter.
2. Shifting with the mechanical unit produces resonance. This disturbing effect is not experienced with the converter train.
3. Normal operating loads exhibit torsionals in the drive, as indicated by the magnitude of load variations and their frequency during the operating cycle. Due to the characteristics of the torque converter drive, it has smaller load variations and practically no cyclic frequency as compared with the behavior of the full mechanical drive under the same operating conditions.

(Turn to page 142, please)

By
Leonard Westrate

Jet Age Problems

Aired by

Aviation Industry Leaders

CONSTANT changes in design, complicated specifications, long lead times, the rapid increase in complexity of design, lack of adequate research and engineering, and similar problems faced by the aircraft industry came in for thorough discussion at the Symposium held in connection with the 6th Annual Convention of the Air Force Association.

The meeting was held in connection with the International Air Exposition at Detroit, Aug. 30-Sept. 1. Speakers representing the aircraft engine, components, and airframe manufacturers presented their problems in a series of discussions in an all-day meeting Aug. 29.

Speaking for engine manufacturers, Roy T. Hurley, president and chairman of Curtiss-Wright Corp., said that the rapid adoption of jet engines found the industry unprepared to produce them in many respects. The turbo-jet engine, he said, caught the industry without the machines or tools for the manufacture of large diameter, lightweight rings of corrosion resisting alloys. Also, it was unprepared for assembly of thin sheet metal stampings and forms into large assemblies which are welded together under close tolerances. Other phases for which the industry had not yet developed techniques were production of compressor and turbine blades, quantity production of high density alloy forgings, and techniques of shell casting and precision casting of large, light-weight steel and aluminum housings.

Problems Just Beginning

He said that for the next 10 years at least, changes in design and structure of aircraft engines will be numerous and far-reaching, posing knotty problems for foundries, forging shops, machine tool builders, the welding industry, and the metallurgists and chemists. He said that if delays are to be avoided after new engine programs are started, development of special equipment and machines and manufacturing techniques must be linked closely with the time schedule of developing and testing of the new engine.

Mr. Hurley also strongly urged a pricing and facilities viewpoint by the Government that will permit engine builders to provide their own facilities. That

would permit coordination of engine design with manufacturing methods when the engine is being designed, he said. He pointed out that earnings of the aircraft industry between 1934 and 1952 averaged approximately two per cent of sales after taxes, a level not sufficient to provide facilities and production know-how.

Malcolm P. Ferguson, president of Bendix Aviation Corp., told the group that the increasing complexity of aircraft components poses a serious problem for manufacturers. He pointed out that, compared with World War II-type planes, present production aircraft have maximum speeds $1\frac{1}{2}$ times greater, are seven times more powerful, and achieve $1\frac{1}{3}$ times greater maximum altitude. These developments require an entirely new concept of accuracy and reliability in components, he said. For example, variation of five per cent in frequency of the standard 400-cycle electric circuits was permissible in World War II equipment, whereas present equipment will tolerate a variation of no more than $1/10$ of one per cent for effective performance.

The trend toward more automatic equipment which, at the same time must be smaller and lighter, he added, requires infinitely greater accuracy, better finish and uniformity in manufacturing, and much more severe tolerances than ever before necessary. These production techniques are extremely costly, he said.

Mr. Ferguson made three recommendations to increase efficiency of the components program:

Greater standardization is necessary, he said, in the event of a sudden shift to all-out mobilization.

More cooperative planning also is needed to reduce lead time for manufacturing and tooling components. He said a better understanding of performance and engineering requirements during development of a new design is a "must."

Simplification of complex specifications was his third recommendation. He cited one item which sells to the Government for about \$20 and weighs two lb, for which the specifications weigh 48 lb.

(Turn to page 108, please)

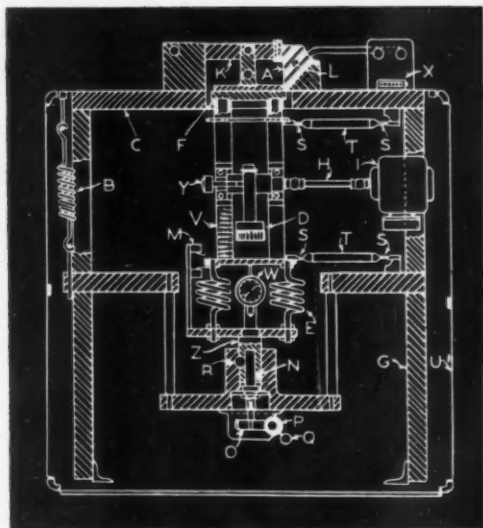


Fig. 1—A simulated service fatigue test of a rubber motor mount in cross section shows how the Ford Research Laboratory at Dearborn, Mich., set up a high frequency test which correlated well with results on Ford's test track.

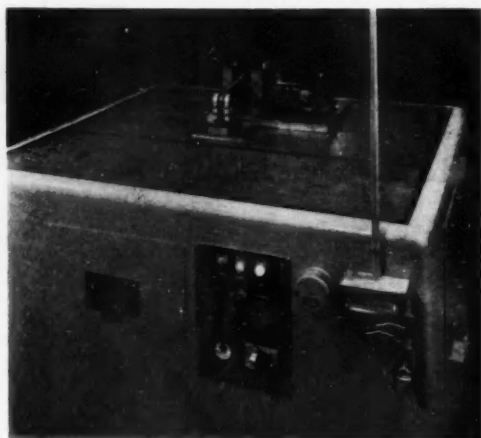


Fig. 2—Fixtures for a torsional fatigue test of a section of track chain assembly of crawler tractor in the International Harvester laboratory were simple in design. A Baldwin SF-10-U machine of 10,000 lb capacity was used.

Testing Machine Setups

OFTEN it is practically impossible to analyze theoretically or photelastically the involved three-dimensional arrangements of stresses. Furthermore, such variables as internal residual stresses, surface condition of a part resulting from differences in fabrication method, and the notch sensitivity of the surface metal, make an entirely theoretical analysis almost hopeless. In such instances fatigue tests of assemblies are necessary.

To set up tests for materials and machine parts in such a way as to simulate the stress conditions under which the material, machine part or structural element operates, sometimes taxes engineering ingenuity. On the other hand, in spite of frequent apparent necessity for complexity in designing fixtures for simulated service tests, many such fixtures have turned out to be simple.

Several simulated service test fixtures which have been designed for use on fatigue testing machines are described here. Special fixtures have been used for such diverse testing as rubber mounts for automobile and truck engines, piston pins, bearings, airplane parts, gears, and steering spindles for automobiles, trucks, and tractors.

Figure 1. serves the double purpose of showing how rubber engine mounts are tested in a special fixture

designed for that purpose in the research laboratories of the Ford Motor Co. and how the Baldwin-Sonntag SF-1-U fatigue machine operates. The test itself is of interest because it showed the practicability of high speed vibration—1800 cycles per minute—in testing these rubber parts. Rubber temperature remained at approximately 100 F during the greater part of the test and rose sharply just before failure, thus serving as a means of recognizing incipient failure.

The essential design features of the test fixture are apparent in Fig. 1. Its function is to transmit the vibratory force of the reciprocating platen to the face of the motor support, simultaneously introducing a slight rocking motion to simulate motions produced by an automobile.

The static load applied on the rubber mount was made equivalent to the static load when on an automobile. The dynamic load gives an over-all motion equivalent to that produced by the automobile on the Ford Motor Co. test track cobble-stone section, as measured by scratch graphs. These loads cause the mount to pass through its zero stress point twice each cycle, which is believed to hasten fatigue failure. Breakdown of a mount was obtained within a desirable interval of time for an accelerated laboratory evaluation.

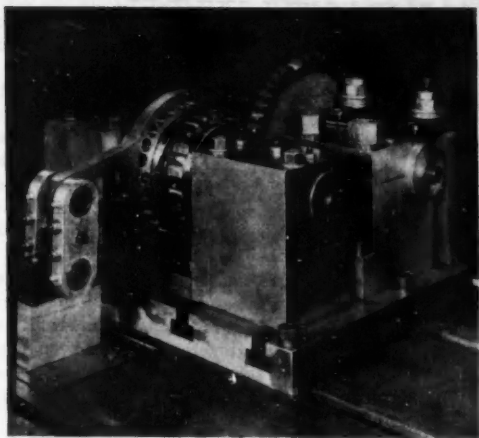


Fig. 3—Fatigue testing of gear teeth is a typical example of simulated service testing with Baldwin-Sontag universal fatigue machines. Holding fixtures are all standard parts except the block holding the stationary gear.

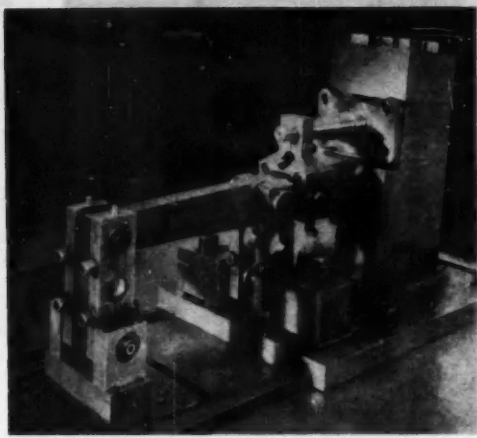


Fig. 4—Here is a king-pin fixture for fatigue tests of front wheel spindles. The spindle is supported in three blocks by a vertical pin which is kept from rotating in the fixture by a key.

Duplicate Operating Conditions

The value of this test depends, of course, on how closely the failures produced on the test machine compare with actual failures in service. The laboratory report states that "On this test the failure types are identical with those developed on the test track and road service. There is also good correlation between the life of a mount on this machine and the life of a similar mount on the test track.

The test fixture consists essentially of a stationary frame on which the rubber mount is attached, a stationary pivot block, and a bar (K) extending from pivot block to the insert on the motor support. The bar is connected near its center to the reciprocating platen of the test machine through a double link with needle-bearings. This link is a part of the standard torsion fixture, and was not specially made for this test, as were the other three simple parts. Thermocouples were inserted on each side of the rubber mount.

The function of Sontag testing machines is to apply a vibratory force and motion to any specimen, machine part, or structure that can be attached between the heavy stationary frame and reciprocating platen. The applied force can have any static or alternating component from zero to capacity in either direction.

The alternating force is produced by an unbalanced

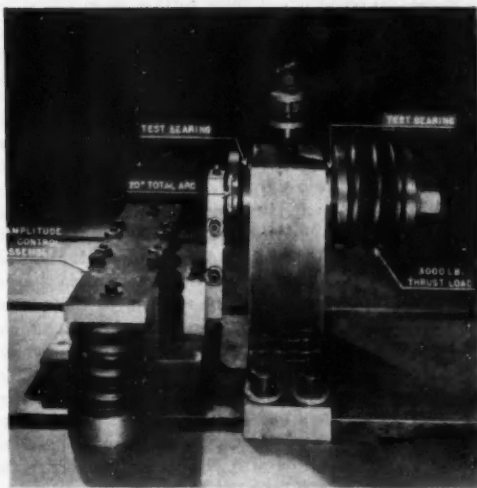


Fig. 5—By means of a spring, a thrust load of 3000 lb is applied to Ford tractor spindle bearings in this fixture. An amplitude control and means of rotating the spindle through a 20-deg arc are included in the test fixture.

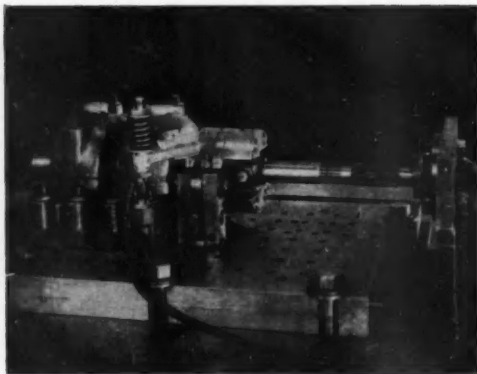


Fig. 6—Reversing loads are applied through needle bearing shackles to a shaft free to rotate in two bearings at the left in this setup for testing universal joint knuckles. The connecting shaft is bolted to the fixture at the right.

rotating mass (D), in Fig. 1, which is supported between two bearings in a cage-like vertical frame, the top of which forms the reciprocating platen (F). The rotating mass is driven by a synchronous motor (I) at a constant speed. Only the vertical component of the centrifugal force is transmitted to the specimen. The horizontal component is absorbed by flex-plate guides (S), held by tubes (T), which guide the reciprocating assembly in the vertical direction.

Two so-called "compensator" springs (E) are attached to the reciprocating assembly and to the stationary frame through plate (Z). These springs absorb all inertia forces produced by the reciprocating masses. The natural frequency of these springs when vibrating freely with the total reciprocating masses of the machine and without the specimen in place must be exactly equal to the operating frequency.

Rigidity of the compensator springs (E) is fixed by the design and is not adjustable in the machine. This means that the total equivalent reciprocating masses must be equal for all testing fixtures. To accomplish this, the weight of the fixtures is compensated for by removing auxiliary weights supplied with the machine to maintain the total reciprocating weight. Of course when the specimen (A) is added, the vibratory system will operate well below resonance.

By attaching proper tuning weights to the reciprocating assembly the compensator springs function in such a way that the alternating force induced in the specimen is equal to that produced by the oscillator and remains so, irrespective of the rigidity of the specimen or the amplitude of vibration. If the rigidity of the specimen changes during the test, then the amplitude of vibration will change too, in order to maintain a constant repeated force in the specimen. The machine is equipped with two reset-type cut-off switches (M). These may be adjusted so that the machine will automatically stop when the vibration reaches a certain amplitude.

A larger fatigue machine of this type, shown in

Fig. 2, applied a torsional fatigue load on a section of track chain assembly of a crawler tractor for comparative tests on variations in design. Tests were made to compare the merits of design changes modified by heat treatment and other variables.

In the set-up for testing gear teeth, shown in Fig. 3, only the block holding the stationary gear is specially made for this test. The vibrating gear is mounted on a leverarm and bearing block that are parts of a standard torsion fixture. Fixtures for larger gears would have to be specially designed to suit the size and type of gear and magnitude and type of load to be applied on the teeth.

The "king-pin" fixture, shown in Fig. 4, for fatigue tests of front wheel spindles in the Ford Motor Company's Manufacturing Research Department, consists of three steel blocksheld together by hex-head cap screws. The spindle is supported in these blocks entirely by the vertical pin, which is kept from rotating in the fixture by a key and keyway. Amplitude of vibration is reduced by a lever arrangement with needle-bearing shackles. The spindle is clamped in the special lever-end clamp during tests. The test was made to establish the fatigue strength of lower hardness spindles with work-hardened fillets as compared with high hardness spindles with ground fillets. Adoption of the former as a result of tests lowered manufacturing costs.

Bearings for spindles of Ford tractors were given fatigue tests by means of a fixture in which a thrust load of 3000 lb was applied by a spring. The test fixtures, Fig. 5, include a simple amplitude control assembly and means of rotating the spindle through a 20-deg arc. The test was utilized to compare the qualities of thrust bearings supplied by several manufacturers and eliminated costly and time-consuming field trials.

In fatigue tests of universal joint knuckles, reversing loads were applied through needle-bearing shackles to a shaft free to rotate with minimum play in the two bearings at the left in Fig. 6. The connecting shaft was bolted to the fixture at the right. The amplitude limiting device in front operates automatically when contact is made with the vertical shackles that apply the reciprocating load. The test evaluated material and design changes which produced savings in machining and material.

Tubeless Tire Possibilities As Original Equipment

ALTHOUGH the tubeless tire is not likely to appear as standard equipment on motor cars in 1953 models, it has been the subject of considerable discussion and like many other basic developments has resulted in divergent opinions in the absence of conclusive information.

AUTOMOTIVE INDUSTRIES recently queried engineers among motor car producers and solicited comments (Turn to page 136, please)

North American's water boiler type atomic energy reactor. Concrete blocks, used for shielding, have been removed, showing the tank-like housing where the graphite reflector and core are located. The superstructure shown is not part of the reactor, but is one of the test units which can be used for experiments.

Atomic Energy Reactor



Built at Aircraft Plant

A SMALL atomic energy reactor, from which information of value in designing improved reactors for various purposes may be obtained, was put into operation recently at the Downey plant of North American Aviation, Inc.

Designed and built by North American's Atomic Energy Research Department under contract with the Atomic Energy Commission, the reactor is generally similar in construction and physical size to other low power water boiler reactors in the United States. A difference is that its very low power, less than one watt, makes a cooling system unnecessary. A reactor of such small power is not used as a producer of fissionable materials.

The exterior of the reactor is shielded by a housing of two-ft thick concrete blocks each weighing 1000 lb, forming a structure about the size of a single car garage. The concrete surrounds a cylindrical graphite reflector five ft in diameter and six ft high, formed by stacking graphite bars horizontally inside a steel tank. The reflector surrounds the reactor core, a stainless steel sphere one ft in diameter. Production of atomic energy takes place inside this sphere which contains a Uranium 235 enriched uranyl nitrate solution. It is from the nuclear fission of this material in a water

solution that the reactor derives its power—and its name "water boiler."

The rate of fission, the production of atomic power, is controlled by a system of control rods which can be moved horizontally through the concrete and graphite to the core. These rods, made of cadmium, boron, and aluminum, have a retarding effect upon the nuclear fission inside the core. Depending upon their nearness to the core, the rods can control the fission from a stop to wide open rate of reaction. The graphite reflector turns back neutrons which come from the core.

Materials to be bombarded by neutrons and thus made radioactive can be placed inside the core by means of a "glory hole" which connects through a channel to the outside of the reactor. An instrument panel near the water boiler records the amount of radiation for these experiments. The control rods to regulate the rate of power production are also operated from the instrument panel.

Two engineers are required to put the reactor into operation and bring it to the full power stage. Only one engineer is needed to keep the reactor in operation, while an additional engineer conducts the test work.

Assembly Line Fabrication

For Aircraft Exhaust Systems

A complete Pratt & Whitney exhaust system for the 3500 hp R-4360 engine. Note apparent similarity of units.



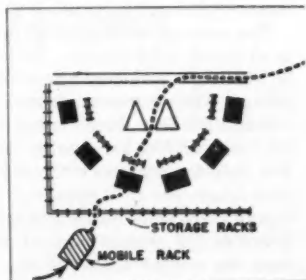
VOLUME has been raised and space requirements reduced in the fabrication of exhaust systems for R-4360-59 Pratt & Whitney aircraft engines at Ryan Aeronautical Co. by new assembly arrangements.

Because of the necessity for expanding Wasp Major "-59" quantities in limited factory space, equipment has been centralized in four contiguous areas for flow type fabrication. In each area, machines and fixtures are placed in specific patterns to meet the flow of parts. Special dollies, rolling on continuous floor tracks, carry parts to machines.

This is a great improvement over the former method where equipment had to be spread out to allow batches of parts to be carted to each machine. A 40 per cent saving in floor space has been realized by grouping jigs and tools along the new tracked conveyor lines.

An advantage of the system is the achievement of balanced control of both parts and production. The parts consist of seven large, tubular sections of stainless steel, almost identical in appearance although each is actually different in design. All seven fit together to form a complete exhaust system for an engine of a Boeing C-97 Stratofreighter or KC-97 aerial tanker airplane. Since shipments are made in complete engine sets, it is highly desirable to obtain a balanced flow of parts from production lines.

Schematic diagram outlining the flow of a typical component through the Ryan production line for Pratt & Whitney exhaust systems and the general arrangement of jigs, fixtures and conveyor lines.

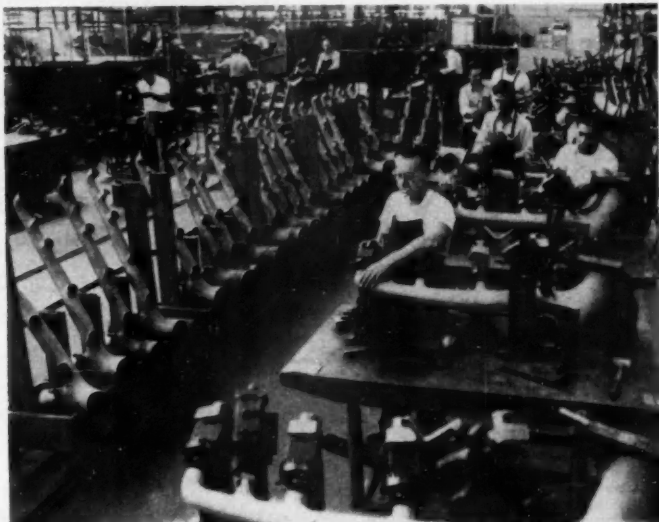


Methods

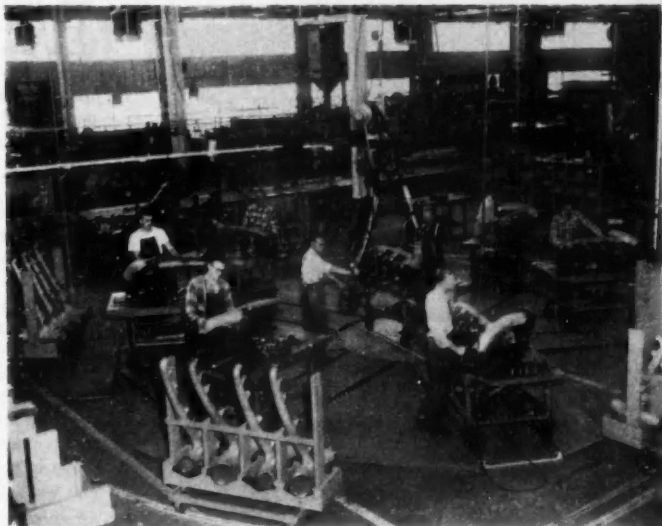
With high production, this would have been difficult under the former batch system because of the similarity of parts. Large numbers of indistinguishable components would have been shuttling between machines in confusing array. Only a time-consuming segregation and count would have disclosed the relative numbers of each part in production. With the new system, it is possible at all times to observe the progress of the parts and the exact numbers in each area. Adding to this facility is the fact that all dollies and racks are keyed to specific fixtures and designed to hold a normal day's work.

In each area roving crews can be used to perform specialized tasks, such as welding. These crews go from one fixture to another, performing identical types of work on slightly different parts. They are followed by workers who perform other specialized jobs. In this way, employees become specialists in skilled tasks and are not required to perform all types of work at a fixed location.

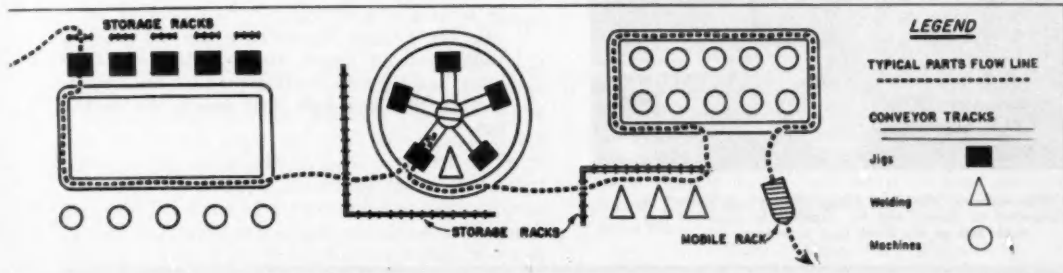
The system can be geared to varied rates of production. Of
(Turn to page 98, please)

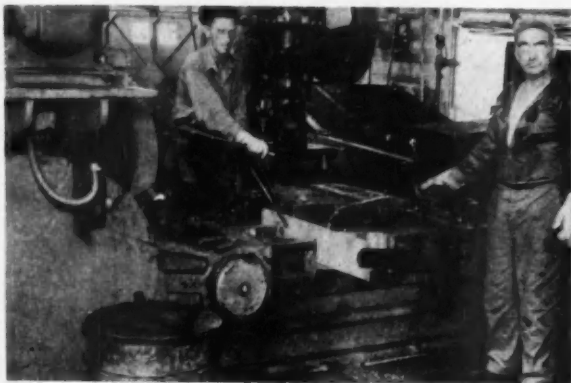


View of Area 2 showing the conveyor dollies, racked with parts, and a line of precision assembly jigs. After being marked in these jigs, the components are trimmed, faced, burred and sandblasted in a series of machine operations.

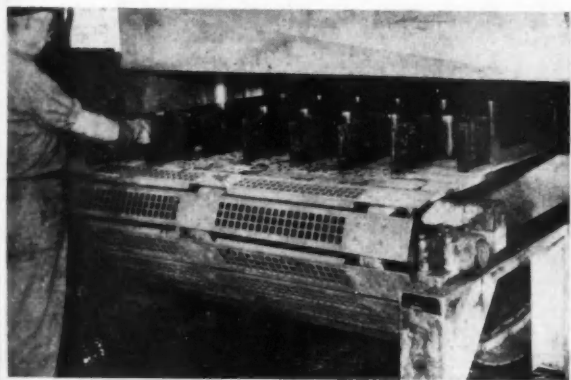


This arrangement of mobile jigs is in Area 3 where the stainless steel exhaust sections are fitted with flanges and rolled into a central turntable. An overhead spotwelding machine, with twin guns, is used to spot weld the flanges. The turntable is swung around to provide maximum access.

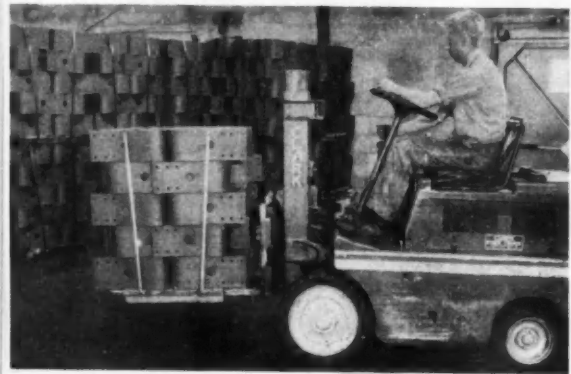




Bumperettes are formed in two strokes in a bulldozer, using blanks heated to 1800 F for this operation.



Following quenching the work is drawn in a continuous tempering furnace; the loading end being shown in this view. Work is held at 925 F for 50 minutes.



After painting and inspection the bumperettes are palletized as shown, transported to storage and for shipment by means of fork trucks such as the Clark truck seen here.

Making Military Truck BUMPERETTES at Tuthill Plant

RECENTLY the Tuthill Spring Co., well known producers of leaf springs for motor vehicles, placed in operation a new plant in Momence, Ill. This plant contains 27,000 sq ft of manufacturing space and is equipped for the production of leaf springs, bumperettes, cultivator tines, spring harrow teeth, and other specialty items.

One of the items of general interest at the Momence Div. is the production of heavy duty bumperettes for military trucks. As illustrated, these are made of SAE 1075 steel or equivalent, using stock seven-in. wide and $\frac{3}{8}$ -in. in thickness. Each finished part weighs 23 lb. The stock is purchased in mill lengths long enough to provide 10 pieces from each length.

A sampling of illustrations is given to show some of the basic steps in the process. After shearing and punching the stock, blanks are heated to a temperature of around 1800 F and formed to shape in two strokes in the bulldozer shown here. The work then is quenched in oil and drawn in a continuous tempering furnace where the load is held at 925 F for 50 minutes.

The parts then are inspected on special jigs, transported to the paint shop for painting, given a final inspection and made ready for shipment. In keeping with modern materials handling methods, the finished bumperettes are delivered in pallet loads as shown, transportation of pallets being handled with the familiar fork truck equipment as the Clark fork truck seen in the illustration.



Ring gear sub-assembly involves running 10 cap screws. This five-spindle multiple nut runner runs five alternate cap screws, then disengages the sockets and pivots on a central air position and runs the other five cap screws.

How Multiple Nut Runners Save Time In Assembly of Ford Differentials

ALL differentials for Ford cars are assembled in a compact section of Building No. 1 of the Mound Road Plant of the Ford Motor Co. in Detroit. An outstanding feature of this facility is the extensive use of multiple nut runners instead of single power tools on the assembly line.

There are six major operations in the assembly of Ford differential carriers. First, the two bearing caps are assembled to the carrier with four cap screws preparatory to machining. Second, with caps in place, the bearing seat is cross-bored. Third, the bearing caps are removed to permit final assembly. Fourth, the ring gear is assembled to the differential case with 10 cap screws. Fifth, the ring gear sub-assembly is placed in the carrier and the two bearing caps are replaced and cap screws run down lightly to permit final adjustment. Lastly, bearing caps are adjusted, tightened with a torque wrench and the unit sent for final sound test.

To perform these operations more efficiently, a compact assembly line on which six multiple nut runners would replace all single power tools was designed.

With a single-station, clutch-type, air-powered wrench, a man could put on the bearing caps at the rate of 160 units per hour. A second man stood beside him and checked every cap screw with a hand torque wrench. The single-station tools were replaced with a four-spindle multiple nut runner made up of four Ingersoll-Rand Size 2P air motors. The new unit runs all four cap screws at one time and turns out 330 units per hour. Torque is controlled by regulating incoming

air pressure and the operator lets the tool run till it stalls. Since all four motors are identical and are running simultaneously on equal air pressure, all four screws are run to the same degree of tightness. It is no longer considered necessary to hand check torque after this operation.

The ring gear sub-assembly with its 10 cap screws was a difficult job. With single power tools, a man could produce no better than 100 units an hour. Again, it was necessary to station a second man to check torque on every cap screw. Dimensions of the gear were such that standard air motors could not be combined for multiple nut running, so Ingersoll-Rand designed the new Size 380M air motor which achieves slenderness through use of planetary reduction gears. Five of these units were combined so as to engage five alternate cap screws at a time. When the first five cap screws are run down, the operator presses a button which admits air to a cylinder in the center of the multiple nut runner and actuates a piston which disengages the sockets and serves as a pivot point for rotation of the nut runner to engage the next five cap screws.

Using the five-spindle multiple nut runner, one man can turn out 350 units an hour running a total of 3500 cap screws. As in all the multiple nut runners, the tool is run till it stalls and all cap screws are run to the same required torque. Instead of checking every cap screw, it is now the practice to spot check only an occasional unit.

(Turn to page 104, please)

Continuous Press Forging Applied to Crankshafts

By
Joseph
Geschelin

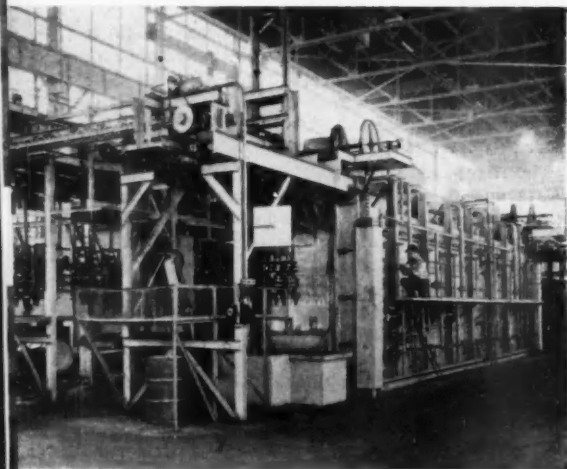
MECHANICAL press forging of crankshafts, long a topic for discussion and experimental production in the automotive industries, has emerged as a continuous and integrated process in a new plant unveiled last month by the Dodge Forge Plant of Chrysler Corp. Designed at the outset for producing the variety of V-8 engine crankshafts for the corporation, it has also taken over the production of at least one six-cylinder job to relieve the present hammer facilities.

A new and modern shop with an extremely high ceiling, providing excellent comfort from the stand-

point of good lighting, safety, and ventilation, houses the press forging facilities. The building proper is 150 ft wide and 462 ft long. This article will describe the first integrated line to be placed in full operation.

(Turn to page 92, please)

Below are the twin Halcraft automatic hardening and tempering furnaces. They heat, quench and temper crankshaft forgings, automatically, carrying them through the process in a vertical position.

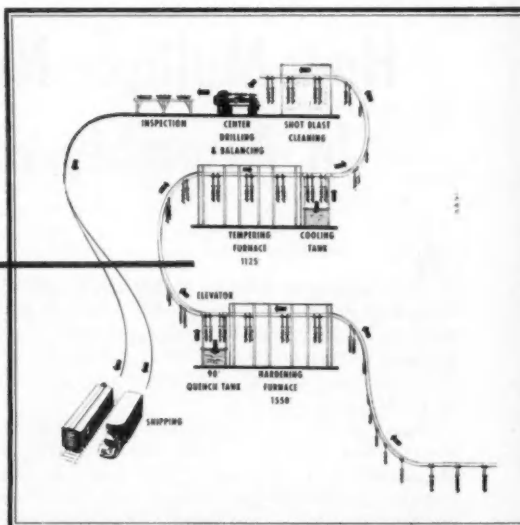


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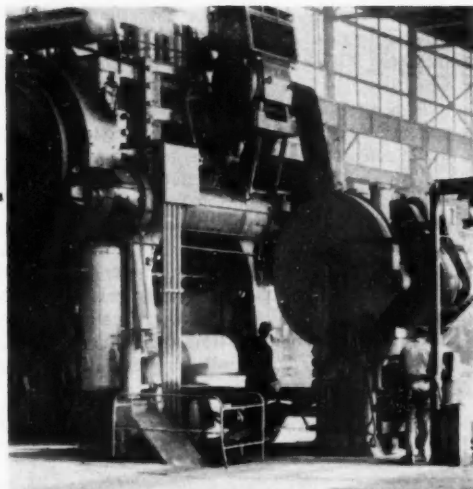
General view of the new Crankshaft Press Shop showing the giant, 6000-ton, Ajax high speed, mechanical forging press at the left. From the press, moving to the right, are the subsequent trimming, upsetting and aligning operations which precede delivery of the forgings to the hardening and tempering process.

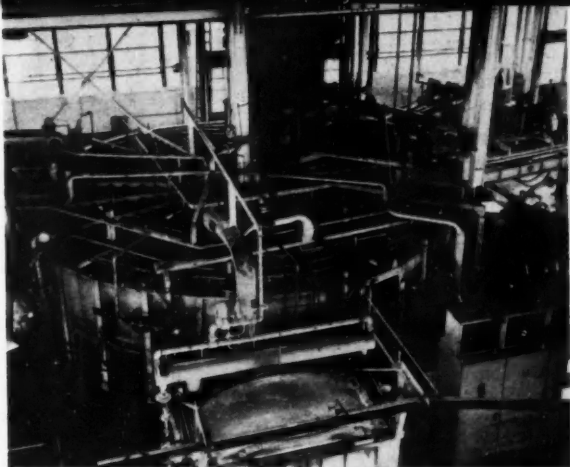
Far Right—

Only two strikes, one on each of two dies, are required to forge the crankshaft in the 6000-ton Ajax mechanical forging press. This high-speed press is capable of more than 35 strokes a minute and is the heart of the continuous crankshaft press forging operation.

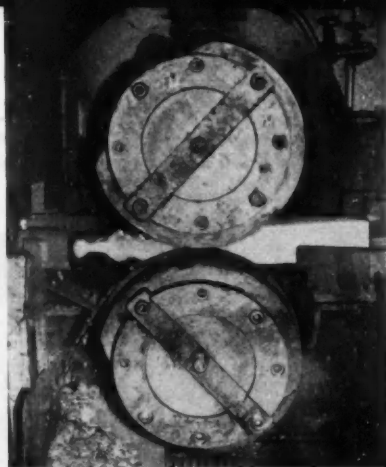


Above is shown the progress of a steel billet, from storage yard until it is shipped as a finished crankshaft forging, at the new Crankshaft Press

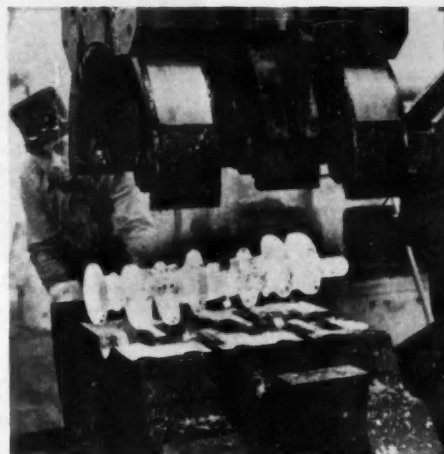
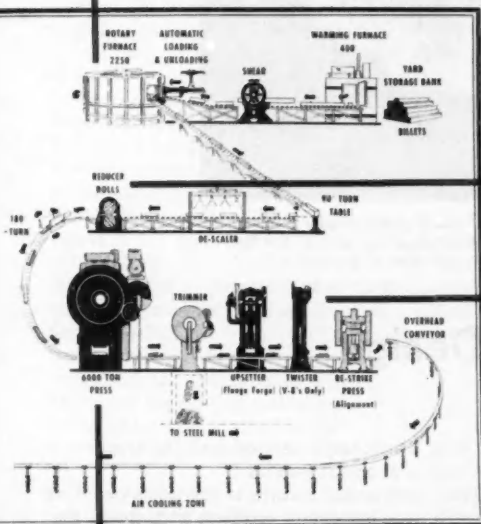




Overhead view of the Hagan automatic rotary furnace, 32 feet in diameter, which receives, heats to forging temperature and discharges steel billets automatically at a rate up to 300 an hour.



After being heated to forging temperatures, crankshaft billets are conveyed automatically to the National reducer rolls. A billet is seen passing through the rollers as they change it from its oblong shape to a configuration which distributes the metal in the places needed for the subsequent press forging.

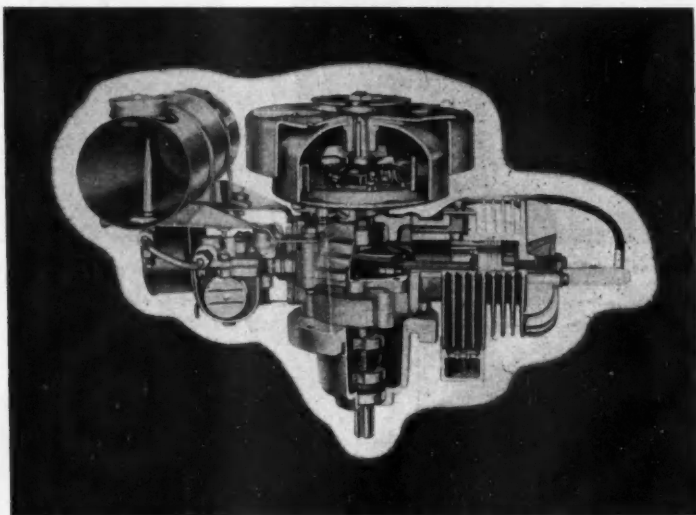


Crankshafts for V-8 engines are forged in a single plane in the Ajax press. The twisting mechanism, lifted in a Clearing press then twists the forgings to place crankpin bearings in proper alignment, as shown at right.

Shop of the Dodge Forge Plant. To permit clearer illustration, the drawing departs from actual plant layout. Photographs key the forging high spots.



Small Two-Stroke Engines



Part cutaway view of single-cylinder Power Products engine. The aircooled cylinder is seen at the right, carburetor and air cleaner at the left. In the vertical plane may be seen the flywheel magneto and fan at the top; and enclosed governor mechanism at the lower end.

of Simplified Design

AN extensive line of small, aircooled, light weight single-cylinder and twin-cylinder, two-stroke gasoline engines is being produced by Power Products Corp., Grafton, Wis., for a variety of applications with engine models suitable for mounting horizontally and vertically and, in some instances, angularly. One of the more recent models—Model 220, Type 270—a single-cylinder, vertical mount engine has been adopted for use in a new Reo rotary type lawn mower.

Single-cylinder engines are available in a range of models having a displacement of 3.1 and 3.6 cu in., respectively; while the twin-cylinder line has three models with 5.7 cu in. displacement, and one with 5.96 cu in. displacement. The Model 220 has a bore of $1\frac{3}{4}$ in., stroke of $1\frac{1}{2}$ in., displacement of 3.6 cu in. Its shipping weight is 16 lb, gas tank capacity one qt.

The vertical mount single-cylinder engine illustrated here is typical of the design of all Power Products engines. The cylinder is an aluminum die casting with with a cast iron sleeve. The crankcase is composed of two permanent mold castings. The muffler too is of aluminum.

Ball bearings on both ends of the crankshaft provide rigid mounting of the shaft with minimum fric-

tion; long, trouble-free service; and elimination of thrust collars or thrust bearings.

Another interesting feature is the adoption of an automotive type carburetor complete with choke, float bowl, and high and low speed jet systems. The carburetor is fitted with a dry type air filter.

Pistons are of aluminum alloy fitted with two rings. The crankshaft is of forged steel with induction hardened bearing surfaces. The engines offer a choice of two types of connecting rods, depending upon the nature of the service. One is a solid bearing bronze rod, suitable for speeds not exceeding 3600 rpm. The other is a forged steel rod with needle bearings at both ends, recommended for sustained speeds in excess of 5000 rpm.

A centrifugal flyball governor is built into the engine to provide accurate speed control under all operating conditions. Housed within the engine mounting, the governor is protected from dirt or grease, consequently is free from maintenance difficulties.

Ignition is supplied by a high output flywheel magneto, firing a 14 mm spark plug. An open type fan, of self-cleaning design, is mounted over the flywheel, and

(Turn to page 118, please)

Special Equipment for Testing Landing Gear

AMONG the problems attending the construction of the British Brabazon giant airplane was that of drop testing the main landing gear. This was undertaken by the Dowty Equipment Co., of Cheltenham, which in 1949 built a drop test machine for aircraft between 80,000 and 160,000 lb gross weight, and in 1950 extended it to form a dual test rig providing simultaneous operation of the two, with the exception of the actual drop.

The rig used is of the swinging arm type, with the arms, the moving posts, and the rear posts forming a parallelogram. Thus the moving post is always maintained in a vertical position. Strong construction was essential because the maximum vertical reaction from the ground would be in the region of 100 tons and would have to be combined with both fore-and-aft, and side loads. The falling mass would be in the region of 40 to 50 tons maximum and would allow for a deceleration of two to two-and-a-half G. For test and development work it is necessary to vary the weight of the falling mass and, therefore, the moving post is provided with a very substantial platform on which cast iron weights

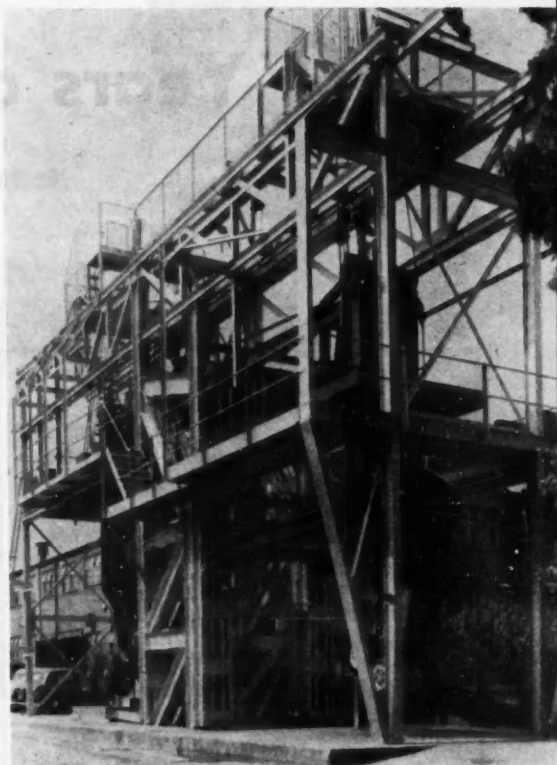
By W. F. Bradley

Special European Correspondent
for AUTOMOTIVE INDUSTRIES

can be bolted, as shown at right.

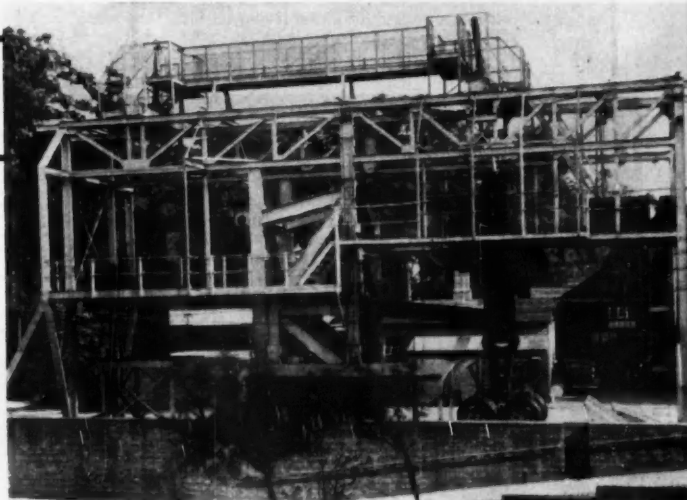
The lifting gear consists of a hydraulic cylinder about eight in. in diameter with a maximum working pressure of 3000 psi. Between the lower end of the jack piston rod and the upper end of the moving post there is a hydraulically-operated quick release mechanism designed to operate under very heavy loads.

(Turn to page 100, please)



Three-quarter rear view of the test rig showing a multi-wheel bogie for a new bomber arranged for drop testing.

Side view of Dowty landing gear test rig. A Brabazon bogie is shown attached to the larger apparatus on the right.



50 Years of .. CADILLAC

Cadillac Highlights

- 1902** First Cadillac car—built by the Cadillac Automobile Co. Engine 9.7 hp. Car speed up to 25 mph. Chain driven.
- 1904** Cadillac Automobile Co. and Leland and Faulconer merge to form the new Cadillac Motor Car Co.
- 1905** Cadillac is pioneer of multi-cylinder engines in motor cars. Introduces four-cyl. engine. Horsepower 27.2 Planetary transmission. Bevel gear drive.
- 1907** Johansson gages imported by Henry M. Leland.
- 1908** Cadillac was the first to achieve interchangeability of car parts. The demonstration of this achievement at a meeting of the Royal Automobile Club in London, England, won for Cadillac the Dewar Trophy.
- 1912** First to equip cars with electric starting, lighting and ignition. This brought Cadillac the award of the Dewar Trophy for the
(Turn to page 64, please)



1903



1905

CADILLAC had its origin in the firm of Leland, Faulconer and Norton, established in 1890 for the purpose of manufacturing machine tools, grinders, and gear cutters. In 1895, this firm was reorganized as the Leland and Faulconer Manufacturing Co. A year later, a gray iron foundry was added and was soon producing high-quality castings.

The addition of the foundry led to the production of gasoline engines of five, 10 and 15 hp for marine use. This new venture ultimately brought the company into the then infant automobile industry.

A fire which destroyed the facilities of the Olds Motor Works in Lansing, Mich., resulted in a contract with Leland and Faulconer to furnish engines for Oldsmobiles. Later, the Leland and Faulconer Co. furnished engines to the Detroit Automobile Co., a newly formed concern which subsequently built the Cadillac automobile.

As a result of a reorganization in 1902, the Detroit Automobile Co. became the Cadillac Automobile Co. In 1904, the Leland and Faulconer Manufacturing Co. merged to form the Cadillac Motor Car Co., headed by Henry M. Leland, general mgr.



1952



1947

CREATIONS . . .



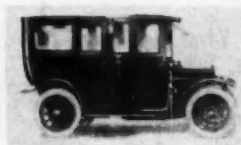
1902



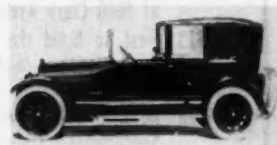
1906



1911



1912



1918

Interchangeability of Parts

Soon after the inception of the Cadillac Automobile Co., Leland took the first major step in the direction of mass automobile production and imported from Sweden the first set of Johansson gage blocks to be used in this country. The wisdom of this step was demonstrated in London in 1908 where, under the auspices of the Royal Automobile Club, three Cadillac cars were completely disassembled, the parts scrambled, and then reassembled into three perfect running cars. This demonstration of the interchangeability of parts won for Cadillac the Dewar Trophy.

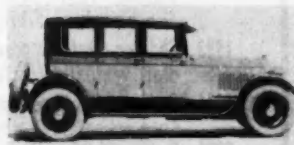
In 1912, the Dewar Trophy was again awarded to Cadillac for the contributions of electric starting, lighting, and ignition.

First V-8 Type Engine

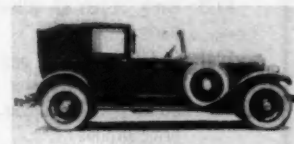
Cadillac in 1905 pioneered the multiple cylinder automobile power plant with the introduction of the four-cylinder engine. In 1914, Cadillac was first to take the lead in building the V-type water cooled eight-cylinder engine. This pioneering effort led to subsequent development of the Cadillac V-8 engine into its present form.

Other Cadillac "firsts" were: the development and use of the Syncromesh transmission in 1928; the introduction of the hydraulic valve silencer in 1930; and the equipping of cars with the no-draft ventilation feature in 1933.

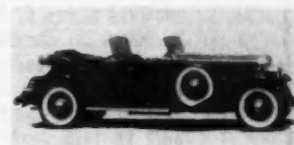
The first cars built by Cadillac were produced in the original Leland and Faulconer plant located at Cass and Amsterdam in Detroit, Mich.



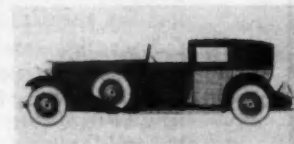
1924



1926



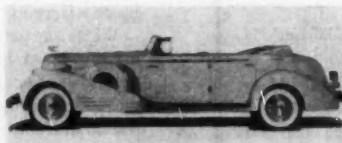
1930



1931



1940



1936



1934

- second time and established Cadillac as the only two-time winner of the trophy.
- 1914 Cadillac first builder of V-type, water cooled, eight-cyl. engine. Horsepower 70. Compression ratio 4.25 to 1.
 - 1917 Cadillac adopted as standard officers' car by U.S. Army after tests at Marfa, Tex. World War I.
 - 1919 Division moves from the old Leland and Faulconer plant at Cass and Amsterdam, Detroit, Mich., to the new Cadillac plant at 2860 Clark Avenue.
 - 1923 First to build the 90 V-type eight-cyl. engine with two-plane, fully balanced crankshaft.
 - 1928 First to develop and use the clashless Synchronesh transmission.
 - 1930 Hydraulic valve silencers introduced by Cadillac. First 16-cyl. engine (165 hp.); also brought out 12-cyl. engine.
 - 1933 Cadillac first to provide cars with no-draft ventilation feature.
 - 1934 Cadillac develops and introduces the Knee-Action front wheel suspension.
 - 1936 Cadillac begins the integral casting of cylinder and crankcase for V-8 engines.
 - 1939 Work begun on Allison aircraft engine parts.
 - 1941 Cadillac produces and sells 66,130 automobiles in this year to lead all makes of cars in the upper medium and high price groups.
 - 1942 Cadillac's 40th anniversary. Last car built for the duration of World War II produced on Feb. 5. First M5 tank built on March 31. The M8 75 mm howitzer motor carriage built as companion to M5 tank.
 - 1944 First production model M24 tank shipped April 13, 1944.
 - 1945 War ends. Cadillac resumes automobile production with first 1946 model coming from final assembly line on Oct. 17.
 - 1948 Cadillac's first completely redesigned postwar model car is introduced. Cadillac introduces new 7.5 to 1 compression ratio, overhead valve, 160 hp. engine in 1949 model.
 - 1949 Cadillac builds its 1,000,000th car since founding of Organization.
 - 1950 Don E. Ahrens becomes general manager. Cadillac awarded contract to build light tanks—first in industry to receive major contract for production of defense materials. 100,000 car production mark passed for first time in history of Division Nov. 16.

As operations expanded, a new plant, which is the present location of the Cadillac Motor Car Div. of General Motors Corp., was built on Clark Ave. Operations moved to the new building in 1919.

Cadillac became a division of General Motors Corp. in 1910, and in that year introduced the closed body as standard equipment. In this period production was around 10,000 cars each year. A milestone was reached on Nov. 25, 1949, when the Division built its one millionth car, and the year was climaxed with the production of 81,545 cars.

As early as 1939, Cadillac had been selected to produce parts for the Allison aircraft engine. The continuance of this activity accounted for a large share of Cadillac's contribution to the war effort.

The last Cadillac car for the duration of World War II was produced on Feb. 5, 1942. For the duration of the war period that portion of Cadillac's facilities not devoted to aircraft production was used first for the building of the M5 tank, M8 75 mm howitzer motor carriage, and M24 tank.

Cadillac resumed automobile production by bringing the first 1946 model from its final assembly line on Oct. 17, 1945. In this immediate post-war period a program for extensive rearranging and modernizing of plant facilities began.

In the manufacturing section the foundry was completely rebuilt to provide greater capacity; an extension to the final assembly building was completed to permit the installation of an 1800-ft straight line final car assembly conveyor; a completely new plating and polishing operation was installed; and more than 50 presses were added to the operations in the Sheet Metal Division.

During 1950, Cadillac reached a new high level in automobile production, passing the 100,000 car mark for the first time in its history. For the 12-month period Cadillac built 110,535 cars.

Serving the Nation's Defense Program

The nation's defense program brought Cadillac an important assignment during 1950 with the awarding of a contract to produce a new light tank. The first production vehicle was presented to the Armed Forces on Mar. 27, 1951. In carrying out its tank program, Cadillac is using a plant facility in Cleveland, O.

In addition to the tank program, Cadillac is engaged in several other defense projects at its Detroit plant. Among these are: the precision machining of gears and other parts that are used in the transmissions for heavy, medium, and light tanks; the manufacture of transmission valve control bodies; and the furnishing of replacement engines and transmissions for the M24 tanks built by the Division during World War II.

While automobile production schedules have been reduced because of restriction in obtaining materials, the total employment at Cadillac has moved upward. With defense work dueling with the manufacturing of automobiles, the Division currently employs more than 13,000 people in its Detroit and Cleveland plants.

Simple Calorimeter for Measurement of Arc Energy

By

M. W. Sims and A. M. Krakower

Specialty Transformer and Ballast Dept.
General Electric Co.

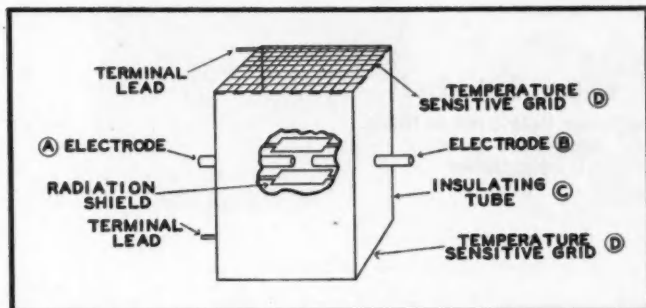
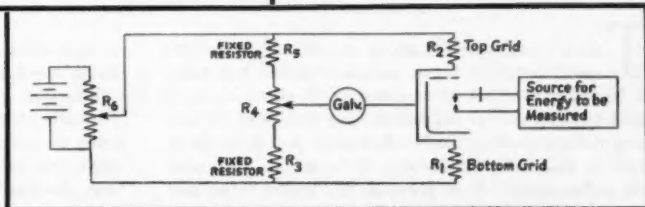


Fig. 1
Sketch showing construction of calorimeter

Fig. 2
Circuit arrangement for determining temperature of grids.



EVALUATION of electric arc discharge devices, such as those used to ignite fuel in oil burners or jet engines, is complicated by the many variations present in a combustion system. A simple measurement of the electrical energy converted to heat within an arc can eliminate need for much of the more elaborate and expensive testing ordinarily required in ignition studies. A method developed for making direct measurements of arc energy has been found reliable, accurate, and free from the many variables present in combustion tests, without requiring any complicated components or techniques.

The calorimeter is a simple tube, C, Fig. 1, preferably, though not necessarily, of a thermally and electrically insulating material, with electrodes arranged so that the arc whose energy is to be determined may be established inside the tube at approximately its center. If a spark plug is to be used, the tube may be proportioned so that the arc will be at the right place. Over each end of the tube is placed a grid of temperature-sensitive fine wires, D, such as ordinary Formex coated copper magnet wire, forming an electrical resistance responsive to temperature.

When the tube is mounted vertically in air, the heat liberated at the arc and the chimney effect cause an

upward flow of air through the tube. Since the air leaving at the top is warmer than that entering at the bottom the upper grid assumes a temperature higher than that of the lower grid. Other things being equal, this temperature difference will be an indication of the energy being liberated at the arc, though it could hardly be called a "measurement." However, if these temperature conditions be duplicated by a known amount of heat introduced at the same location, other things remaining unchanged, it can be reasoned that the arc energy must be equal to the known heat input which produces the same temperature conditions.

By clipping a small resistor across the electrodes A and B (Fig. 1), and applying adjustable electrical power through suitable meters, any temperature conditions, such as those produced by the arc, may be duplicated. The average power delivered to the arc is thus indicated on the electrical instruments when the controllable heat input produces the same temperature conditions as the arc discharge being investigated.

Before going into details of the electrical circuit further consideration should be given to possible errors arising from such losses as conduction of heat through

(Turn to page 102, please)

Low Cost Blanking Dies for Light Gage Aircraft Parts

By G. V. Rutkoskie

Tooling Foreman, Master Layout and Template
Douglas Aircraft Co., Inc.
El Segundo Division

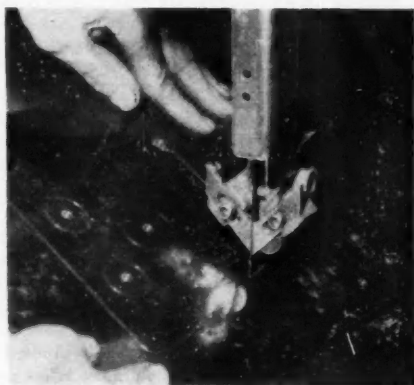
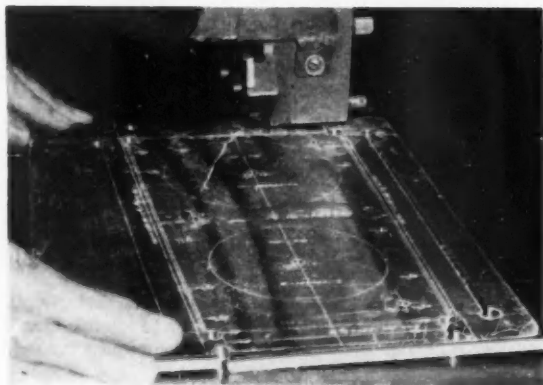
THE pierce blank template, or PBT as it is commonly referred to, is essentially a low cost class B blanking die that is mounted on $\frac{1}{4}$ in. hot rolled steel backing plates. Rubber or cork strippers are employed for expelling the blanked part, and Kirksite is used in place of steel for the die material. By using the softer metal, it is possible to "broach" the die, thus eliminating time consuming filing that is necessary when steel dies are used. The punch material is $\frac{1}{4}$ in. plow steel. Due to the thin backing plate, it is necessary to use specially designed piercing punches with knurled bases. Die and punch are secured to their backing plates with $\frac{5}{32}$ in. steel rivets.

The simplicity and ease of construction of the PBT lends itself readily to the assembly line method of production employed at the Douglas Aircraft El Segundo Division. By utilizing this method it is possible to produce these tools in an average time of eight hours per tool. Whereas, formerly, an individual was responsible for the complete fabrication of the tool, he now does only one simple operation of a series.

Fabrication of the PBT begins with the punch which, as in the case of most blanking dies, is the nucleus of the tool. The punch material is received from the tooling photo laboratory with the image of the part photographed on the surface. The layout

The steel punch is sawed to a $1\frac{1}{2}$ deg closed bevel to the photo outline, as shown below. The second illustration shows how the Kirksite die is sawed to a line $\frac{3}{64}$ in. inside the scribed outline of

the punch. In the third illustration is shown a drill jig clamped to the two backing plates. The attach holes and index holes are drilled through the bushed holes in the jig into the backing plates. Finally,





Completed PBT with blanks and material from which parts were blanked.

man drills all holes to size and identifies the outline of the part. Identification of the outline is necessary because the punch is photographed from a master layout which may include several overlapping parts.

After layout, the punch is then sawed to the photo outline and sent to the filing group. This group files or grinds the punch to a $1\frac{1}{2}$ deg closed bevel which is necessary for die clearance. The punch is checked frequently during this operation to a photo duplicate to insure accuracy. The photo duplicate is on thin gage sheet stock and is furnished with the punch. After filing, the punch is ready for the mounting operation. The punch and die are mounted on $\frac{1}{4}$ in. hot

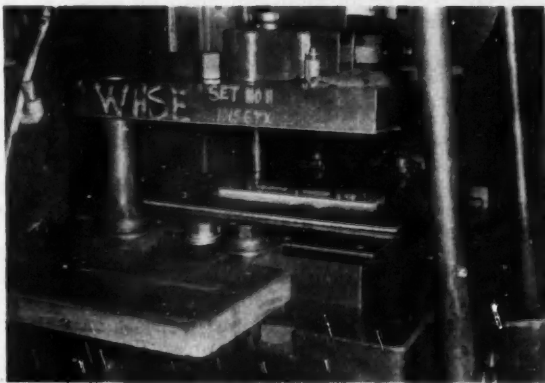
rolled steel backing plates. These plates serve the same purpose as the standard die set for a class B die and afford a means of attaching the PBT to the press.

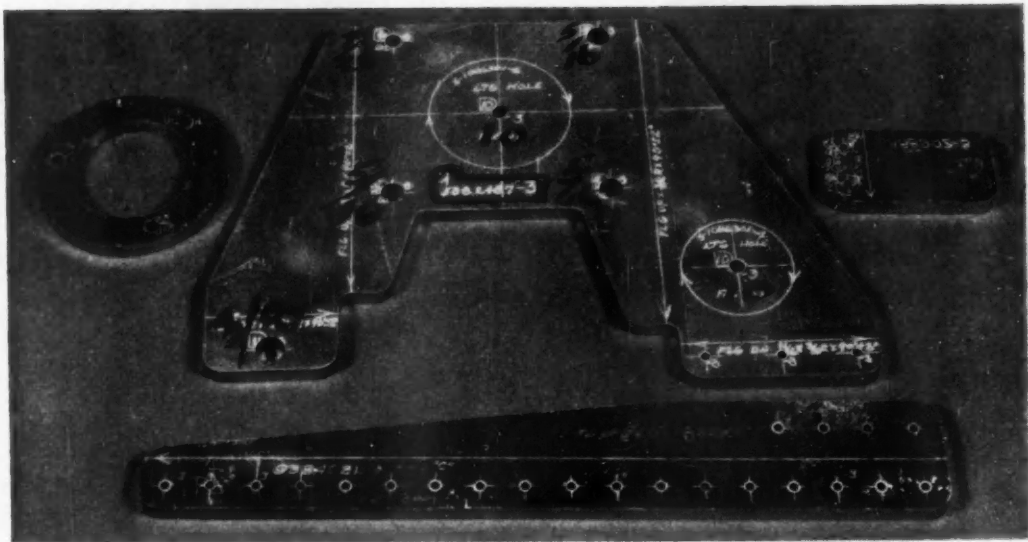
The first step in mounting is to select two backing plates of suitable size and place them in proper position for jiggging. This operation consists of drilling the index holes and attaching holes for locating and holding the punch and die to the die shoe. All holes are drilled from drill jigs with mastered hole patterns that coordinate to identical hole patterns in the punch presses.

After the backing plates have been jiggged, a sheet of $\frac{1}{4}$ in. Kirksite, approximately three in. larger than

as seen in the fourth illustration, the two halves are placed in the press with the punch on the bottom. When the press is lowered, the punch is forced into the die, shearing off the excess Kirksite. While

still together, they are removed from the press with the two halves in mated position and holes for the piercing pins are drilled through the punch into the die. Pins then are driven into position.





Completed punches which have been drilled, sawed, and filed and are ready to be mounted on the backing plates.

the punch, is placed over them. The punch is placed on top of this and three $\frac{1}{4}$ in. holes are drilled through all four plates. These serve as coordinating holes for subsequent operations. While the plates are in this position, the outline of the punch is scribed on the surface of the Kirksite. The punch is then removed and a second line is scribed $\frac{3}{64}$ in. inside the line scribed from the punch.

The Kirksite is now removed and sawed to a 30 deg closed bevel on the inside line. The $\frac{3}{64}$ in. excess material is left on the Kirksite until the die is run in the press where it is broached off by the steel punch. This broaching operation mates the die to the punch.

The punch and die are now ready for attaching to their respective backing plates. The coordinating holes that were drilled previously, index the punch and die to the backing plates while rivet holes are being drilled. After drilling, all rivet holes are countersunk on both sides. The punch and die are then moved into position for riveting.

The rivets used are $\frac{5}{32}$ in. flush-head steel and are set with a pneumatic rivet squeeze. It is necessary after riveting to grind both top and bottom sides of the die and punch to insure that all rivet heads are flush and that the surface is smooth. After grinding, piercing holes in the punch are drilled full size through the backing plate.

The PBT is now ready for broaching. The two halves are placed in the press with the punch on the bottom. The press is lowered, forcing the punch into the die, and shearing off the $\frac{3}{64}$ in. excess Kirksite.

The PBT is removed from the press with the two

halves in mated position. Before separating the PBT, the holes in the punch are back-drilled into the die backing plate. The die then is separated from the punch and the excess material that was broached from the die is removed. The piercing pins are then driven into the die backing plate and rubber or cork strippers are glued to the backing plate around the inside of the die cavity and around the perimeter of the punch. The punch is inverted and all piercing holes are relieved for slug clearance. This completes the PBT and, after trial parts are run, it is ready for production.

The PBT is particularly suited for aircraft work where relatively short runs are the rule. The low cost of replacement and ease of maintenance of the PBT are advantageous in that engineering design changes are fairly frequent and the cost of steel dies would be prohibitive for those parts that are subject to frequent change.

Due to the light construction of the PBT it is necessarily limited to blanking soft, light gage materials such as aluminum, plastic, phenolic sheet, etc. Material gage should be limited to 0.072 in. as heavier material will spread the die, creating excessive clearance which will cause the parts to burr. Materials harder than 75 ST aluminum will dull the punch and therefore should not be used.

The size of the part that can be blanked with the PBT is subject only to the limitations of the press. At the present time PBT's measuring 48 in. by 88 in. are being run on 245 ton Minster presses. In the near future PBT's measuring 54 in. by 143 in. will be run on a 600 ton hydraulic press. It is anticipated, however, that $\frac{1}{2}$ in. backing plates will be necessary.

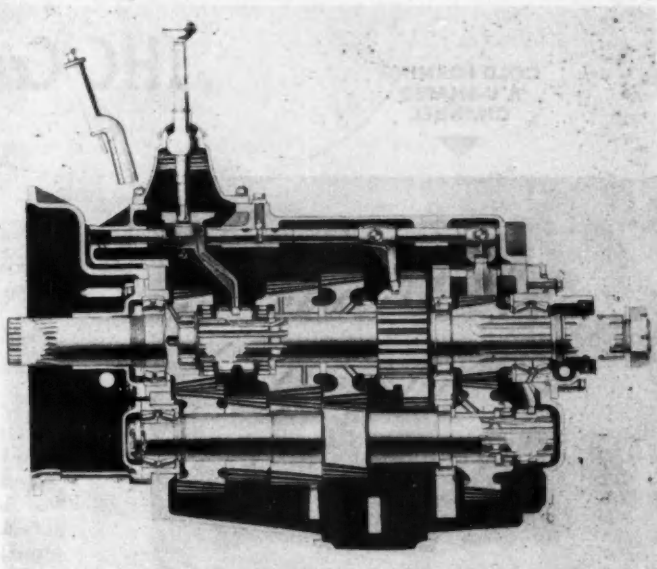
Four-Speed Transmission

for Use with Torque Converters

Now in production is a four-speed transmission that has been designed for use with torque converters on engines up to 400 hp. Development of this Model 4-FS-1440, according to the Fuller Manufacturing Co., manufacturer of the new unit, was achieved through teamwork between Fuller and makers of heavy duty equipment and industrial engines.

This new transmission has been engineered with closely spaced gear ratios and a high ratio of capacity to weight. It was built specifically for the most advanced torque converters, and is said to provide greatly increased pulling power and versatility under severe hauling conditions.

The 4-FS-1440 offers the following ratios in the four forward speeds: first, 1.98; second, 1.40; third, 1.00; fourth, 0.71. Reverse ratio is 1.61 to 1. An SAE



This new transmission has been specifically designed for use with torque converters on heavy duty applications.

No. 1 clutch housing is used on the transmission. Weight of the entire unit is 775 lb.

For power take-off, the transmission has two SAE standard large openings. Oil capacity is 14½ qt.

Service Classifications for Engine Lubricants

DURING the past year there has been considerable discussion in industry circles regarding the new API "service classification" for engine lubricants. In the absence of a formal statement tracing the ramifications of this change in API definitions there has been some confusion and much misunderstanding. Consequently a statement was requested from API in an effort to clear up the matter for the benefit of our readers. The following statement was pre-

pared for AUTOMOTIVE INDUSTRIES by George A. Round, chairman, API Panel on Service Classifications:

In 1945, at the request of the automobile industry, the API set up classifications of engine oil types under the designations Regular, Premium and Heavy Duty. These type definitions have been published in the SAE Standards Handbook yearly beginning in 1946.

By 1950, as a result of engine developments and changes in military

and manufacturers' specifications, five different types of motor oils were being marketed. Under the existing API definitions these oils could all be defined as Heavy Duty type. With the Regular and Premium types this made seven different types of oils to be marketed in at least five SAE viscosity number grades, which was a complicated setup.

Consequently, there was widespread dissatisfaction with the system on the part of both automotive manufacturers and oil companies. To correct the situation, panels were set up by the API and the ASTM, the latter under the chairmanship of C. G. A. Rosen, technical consultant to the

(Turn to page 124, please)

Forming and Drawing Heavy Stampings for IHC Crawler Tractor

COLD FORMING A U-SHAPED CHANNEL

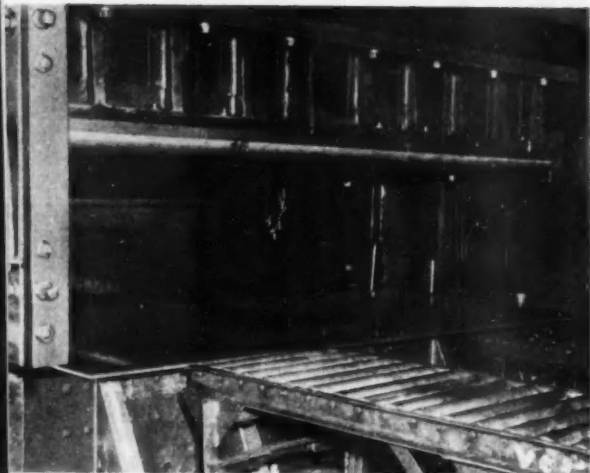


Fig. 1—Oblong blank, $\frac{1}{2}$ in. thick, in the 1500-ton Verson press ready for cold forming into a U-shape channel 18 in. deep, similar to the piece in the background. This stamping is the major component of a track frame weldment.

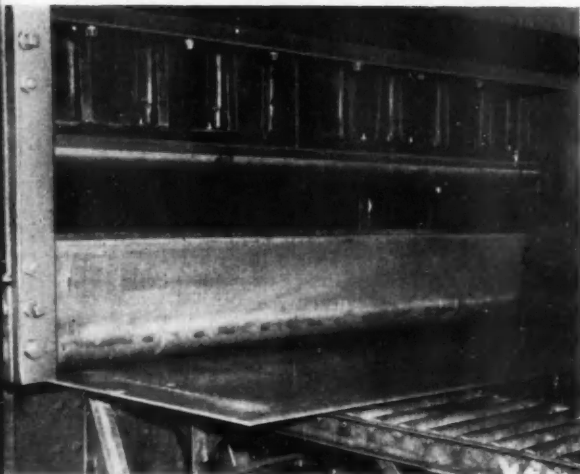


Fig. 2—Track frames stamping as it appears after cold forming from $\frac{1}{2}$ -in. mild steel plate and ready for removal from the press.

By James C. O'Rourke

Mechanical Engineer, Industrial Power Division,
Melrose Park Works, International Harvester Co.

STAMPINGS are employed for many components of International Harvester Company's Type TD-24 crawler tractor. They are made from heavy plate and are blanked and formed, or drawn in some instances, in a 1500-ton Verson hydraulic press at the Melrose Park Works of IHC. Where working is not too severe, the work is done cold but, for severe working, blanks are first heated to 1200 F in an adjacent furnace.

As some of the parts are quite large, the press has a clear bed space of eight by 12 ft and an opening of six ft. Maximum stroke is four ft. In the base are two 280-ton cushions. This makes the press adaptable for handling large stampings but it can also apply heavy pressure over small areas for certain parts that require such pressures to yield the shape specified.

Pieces that have irregular shape are made from blanks sheared to correct contour so as to minimize or eliminate trimming after forming or drawing. For this reason, most parts require a blanking die as well as one for subsequent working. Blanking is done in the Verson press and, because the contours are often long and the stock thick, the press may be as heavily loaded in blanking as in later forming or drawing.

Largest of the stampings produced is one made from $\frac{1}{2}$ -in. mild steel plate that is formed to a U-shape section 18 in. deep. Partly because of the size of this piece and the fact that both a right and a left are required, the plate is not sheared to contour before forming but is made from an oblong blank that appears in



Fig. 6—All of these five stampings are hot formed from $\frac{3}{4}$ -in. stock. They include two side plates, left, and other parts in which working might be too severe if done cold.

DRAWING A GEAR CASE SIDE PLATE

Fig. 1. Blanks are loaded from a pair of roller conveyors and, as forming of the large radii at the bottom of the U is not severe, no preheating is required. Fig. 2 shows the formed stamping ready for removal onto another roller conveyor, as in the background of Fig. 1, and a new blank ready for insertion in the die.

In Fig. 3 is shown, ready for drawing, the contour sheared blank that is to be converted into a side plate for a planetary final drive gear housing. Sketched in Fig. 5 is the assembled housing in which two of the drawn plates are employed. They are joined to mating components by arc welding. Plates have been drawn to a depth of six in., stock $\frac{3}{4}$ in. thick.

Because of the severe working, the blank is heated to 1200 F before drawing and is located over pins, as shown in Fig. 3. In Fig. 4 is shown the drawn part ready for removal from the press. In this case, the die is on the ram of the press and the punch is elevated by cushions from below when the draw is made.

Other hot pressed parts produced from $\frac{3}{4}$ -in. blanks, as well as two of the end plates just described, appear in Fig. 6. Although those at the right are only formed, as drawing is not required, the working still is severe for stock of this thickness, and fracture might occur if cold forming was attempted.

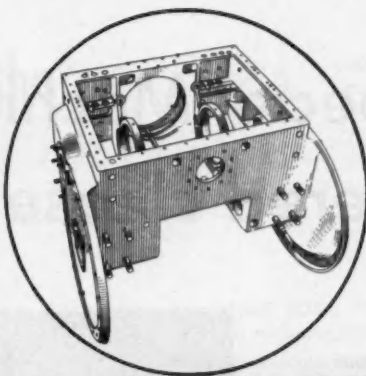


Fig. 5—Sketch of a planet power drive gear housing for a TD-24 International Harvester crawler tractor. Side plates as well as some other parts of this weldment are heavy stampings.

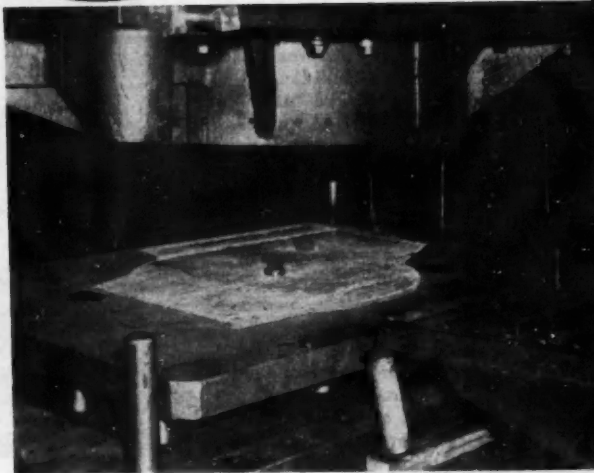


Fig. 3—Shown here is a $\frac{3}{4}$ -in. blank heated to 1200 F and located over pins in a die in the Verson press, ready to be drawn to a depth of six in. The workpiece will become a side plate for a planetary gearcase.



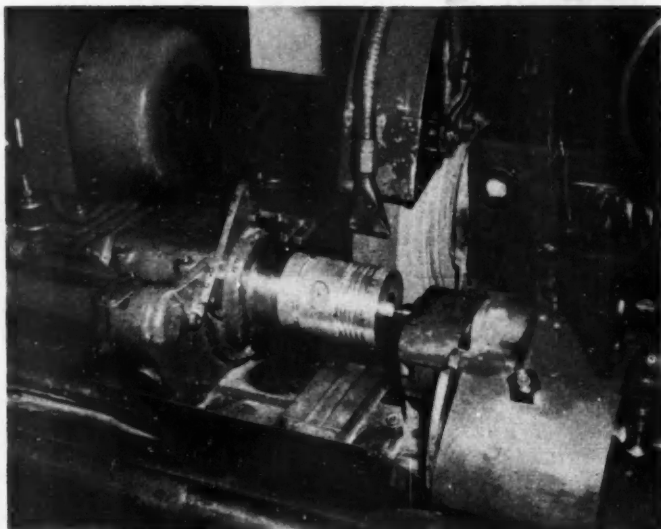
Fig. 4—Side plate as it appears after the draw of six-in. depth is completed by the die on the ram (not shown) and a punch forced upward by the hydraulic die cushions in the base of the press.

Special Machine Grinds Tapered Ellipse on Pistons

SPECIFICATIONS for aluminum pistons, now made in large volume for engines built in the Melrose Park Works of International Harvester Co., call for tapering the OD and making the skirt slightly elliptical. As the entire barrel of the piston must be ground, it clearly requires a special machine to do the job.

The work is done in special Landis piston grinders, one of which is illustrated here. Tapering alone could be done, of course, by traversing the wheel along ways not parallel to the axis of piston rotation but it requires a cam to vary the position of the work during each revolution to grind an elliptical surface. This is accomplished by pivoting, near one end, the bed that carries the centers on which the piston is rotated while being ground and by rocking the bed horizontally by a cam, driven from the spindle, at the other end. Although this motion is only a few thousandths of an inch the desired shape of piston skirt results if the cam is properly made. Grinding is done by a 30 by 3 by 12-in. carborundum wheel of a type designated BC-36 J4 VE.

Pistons are previously machined close to size and then are ground on the special machine at the rate of



Grinding an aluminum piston in a special Landis machine that has a cam-rocked bed. This results in the desired elliptical shape of skirt, as well as in the specified taper for which the machine is set.

about 60 an hour. Dimensions are checked in a Sheffield air gage made for the purpose and pistons are sorted into six groups, each according to diameter, the groups varying in steps of not more than 0.0004 in. Cylinder bores in which the pistons are to be used are similarly checked and, in assembly, pistons are selected from the group giving the correct fit.

• • •

A new course in packaging and material handling has been instituted at Wayne University in Detroit. Ten courses will be offered during the fall semester at the newly established materials management center which was created by demand from industry, and is being underwritten financially by commercial enterprises. The courses include such subjects as product analysis for package development, loading principles, specifications

Wayne U. Starts Course in Materials Handling

for packaging, procurement and materials control, industrial traffic, warehouse operation and automation of industrial processes.

Other features to be offered include institutes on these subjects, and joint

meetings with business organizations on problems of physical supply in commerce and industry. Initially the program is designed for men now in materials handling activities, and prerequisite courses are not required. Completion of six courses in each of the major fields of materials management entitles the individual to a certificate award. Plans call for a full complement of courses later which would lead to a college degree.

News of the MACHINERY INDUSTRIES

By Thomas Mac New

Japanese Government Is Subsidizing Imported Machine Tools Upon Which the Country's Industrial Strength Depends

Survey of Japan's Machine Tool Industry

Ordinarily, the demand for machine tools tends to be greatest during the wartime and returns to normalcy in peacetime in conformity with the industrial scale of the country, especially the scale of the machinery manufacturing industry. In the case of Japan, however, the machinery manufacturing industry had some of the economic features of a munitions industry and for this reason it fell into a slump in the post-war period, with excess equipment resulting from the disappearance of the demand for munitions. Under such circumstances, instead of requiring new machine-tools, the machinery manufacturing industry had a difficult time disposing of its surplus machine tools.

With the subsequent progress in the peacetime conversion of the Japanese machinery manufacturers, the index of their production exceeded

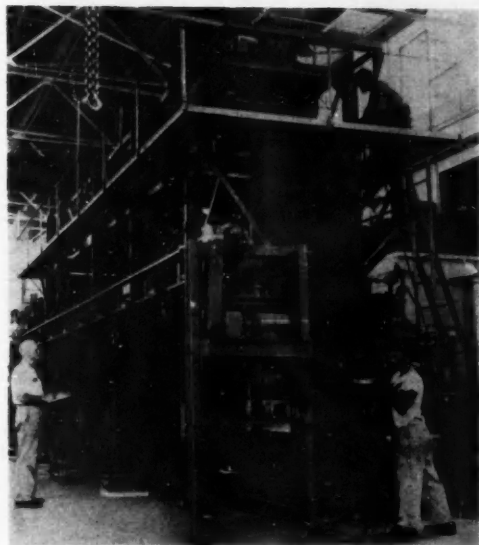
JAPANESE MACHINE TOOL PRODUCTION							
BY KIND OF PRODUCTS							
(Figures indicate number of units)							
Kind	1945	1946	1947	1948	1949	1950	1951
Lathes	3,226	1,291	1,047	970	700	323	560
Drilling machines	1,220	1,213	2,534	2,981	3,031	2,709	5,685
Boring machines	324	972	769	1,001	1,086	418	375
Milling machines	1,070	220	90	73	31	61	217
Grinding machines	568	495	580	944	707	190	1,039
Gear-cutting machines	193	115	73	87	112	36	92
Planers	8	3	13	8	11	22	29
Shapers	387	105	25	62	127	44	16
Slotters	74	3	2	6	5	1	1
Broaching machines	27	35	291	87	105	2	73
Others	209	339	120	238	664	232	1,045
Total	7,306	4,791	5,544	6,457	6,579	4,038	9,132

Source: Japanese Ministry of International Trade & Industry.

in 1949—the year in which the post-war inflation in Japan was arrested—the prewar average level (1932-36). A further sharp rise in production

occurred following the outbreak of the Korean war in June, 1950. In line with this trend of production, the demand for machine tools should have correspondingly increased, but actually a decline took place in 1950. It was not until 1951 that some increase was noted. This failure of the demand to increase correspondingly showed how small was the capital accumulation of the machinery manufacturers, because of the long period of their slump, and how strong was the pressure of the surplus machine tool equipment which had been sharply increased during the war. (The permission granted at the end of 1949 to use approximately 220,000 units of machine-tools designated for reparations also served as an additional pressure). Another important factor was the weak link between the machine tool industry and the general machinery manufacturing industry because of the former's inability to acquire a stable market other than the munitions makers in view of its historical development chiefly as a close link of the arms industry.

(Turn to page 145, please)



A completely packaged special automatic gun barrel hardening, quench and draw furnace is shown being assembled in the large main bay of the Lindberg Engineering Co., Chicago, Ill., Plant No. 1. The gun barrel furnace, including automatic loading and unloading devices, is 42 ft long, 10 ft wide and 19 ft high.

NEW**EQUIPMENT****PLANT • PRODUCTION**

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 81

Semi-Automatic Grinder Grinds Five Surfaces of Jet Blades

A semi-automatic machine has been designed for rapid precision grinding of all types of blades, buckets, vanes and nozzles now being used in current jet engine designs. Uniform work pieces in size and shape are produced.

It is of interest that this machine will grind, with a 24 in. diam wheel, the leading and trailing edges in addition to the external airfoil surface platform and platform radius.

Twisted, warped or broken back contours, straight contours and blades with parallel or non-parallel sides can all be precision ground, according to the maker.

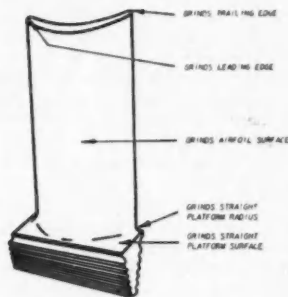
As an example of the machine's versatility, it will grind blades which have a contour or airfoil shape which varies from root to tip. To grind

this shape, as well as the leading and trailing edge, the grinder uses a rocking cradle and master cam. As the 24 in. diam grinding wheel traverses along the work piece, the follower moves along the master cam.

The grinding wheel is profile dressed and, in addition, a radius is dressed on the corner for grinding the radius adjacent to the straight platform. Automatic hydraulic wheel dressing is used for generating this shape on the wheel.

A variety of cycles may be had, depending on the part to be ground and the method of handling desired by the user. On parts without twist, a plunge grinding cycle could be used, for example.

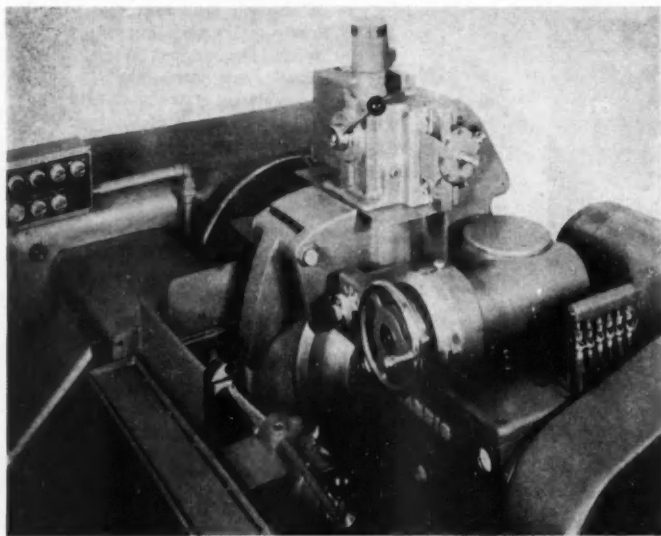
On a typical forged steel bucket, $\frac{1}{8}$ in. to $\frac{3}{16}$ in. metal can be removed



from the forging in one simple pass.

Variable rates of hydraulic traverse are provided for both the wheelbase carriage and overhead dresser. Rates of hydraulic grinding feeds are variable and may be adjusted to suit the workpiece. Landis Tool Co.

Circle E-1 on page 81 for more data



Landis semi-automatic grinder for jet blades.

Horn Router

Now available for many types of trim routing operations in non-ferrous metals requiring an unusually great swing clearance, is the ECCo No. 434H horn router. It can be equipped with either three, five or $7\frac{1}{2}$ hp, 3600 rpm drive motor. Spindle speeds of either 10,000 or 20,000 rpm are obtained by means of a two-step drive pulley arrangement. An adjustable three-position positive depth stop has been built-in for step-routing, while the minimum clearance between the collet chuck and the horn measures 10 in. One standard pilot bracket and guide is furnished with the machine; however, others can be designed and supplied to special order. An air-operated coolant spray attachment is listed as optional and can be furnished at additional cost. Ekstrom, Carlson & Co.

Circle E-2 on page 81 for more data

Four-Way Drilling, Boring and Facing Machine

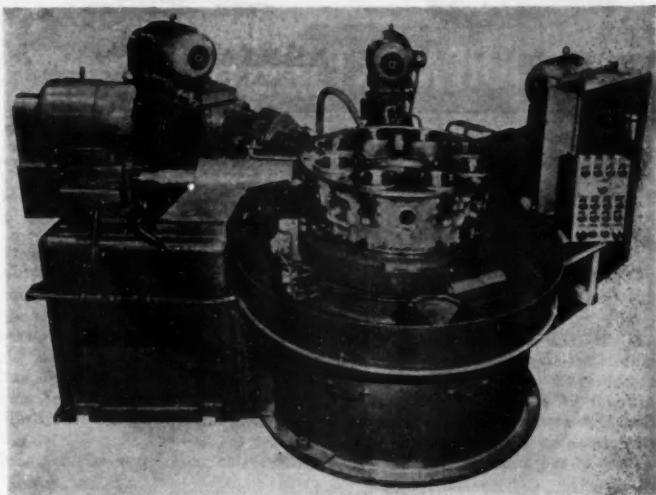
Now on the market is a semi-automatic drilling, boring and facing machine that has been developed to meet the production needs for aircraft jet engine compressor housings.

This machine has four motor-operated heads located at 45 deg positions around the index table. The first head core drills, spotfaces and countersinks a large hole in one of four identical mounting bosses located at 90 deg positions around the housing. The second head drills four holes in the pad face. The third turn faces the pad surface and the fourth finish bores the core-drilled hole.

Five-hp motors power the first and second heads while three-hp motors drive the third and fourth heads.

Manual indexing has been provided to permit inspection of both the tools and the part between successive machining operations. *Modern Industrial Engineering Co.*

Circle E-3 on page 81 for more data



Modern Industrial four-way machine.

Transfer Machine for New Tractor Engine

Recently unveiled was one of the latest transfer machines which was being readied for shipment. This machine is designed for drilling, tapping, reaming, and milling operations on the cylinder block for a new tractor engine being placed in production this fall.

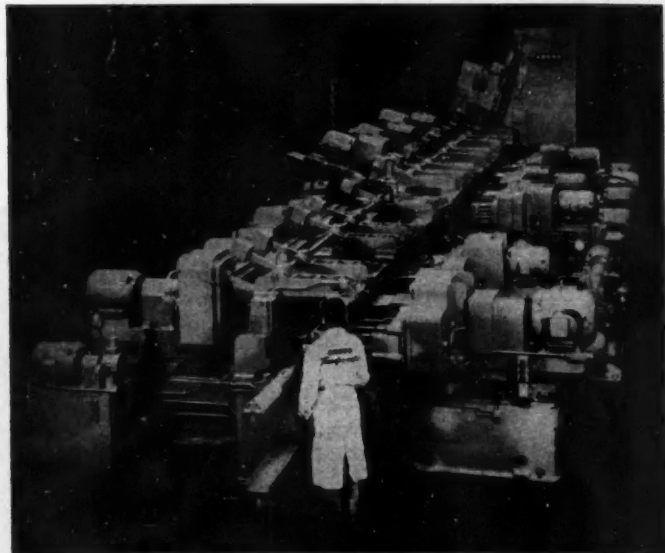
The machine has a total of 23 stations, performs 188 operations, the variety of spindles being combined in 13 multiple spindle heads and four single spindle heads. The operations performed are as follows: one milling, 82 drilling, 18 reaming, 47 chamfering and spotfacing, and 40 tapping

operations of all various types.

All hydraulic and electrical equipment conforms 100 per cent to JIC standards, includes 17 motors for the Cross heads and 14 motors for hydraulic pump drive. Total installed horsepower is 220.

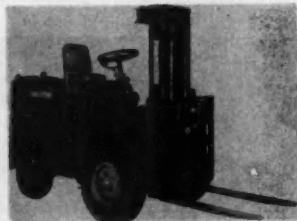
The machine weighs 85 tons, requires a floor space 17 ft wide by 50 ft long. It is of interest that production per hour at 80 per cent efficiency is 58 pieces. *Cross Co.*

Circle E-4 on page 81 for more data



Cross latest transfer machine for cylinder block operations.

Diesel-Powered Fork Lift Industrial Truck



To meet the demand for Diesel-powered units, four fork lift truck models are now available with either gasoline or Diesel engines. These are the LT-62, LT-60, No. 460, and 480-P. (Towmotor Corp.)

Circle E-5 on page 81 for more data

(Turn to page 76, please)

NEW**EQUIPMENT****PLANT • PRODUCTION***For additional information, please use postage-free reply card on page 81**(Continued from page 75)*

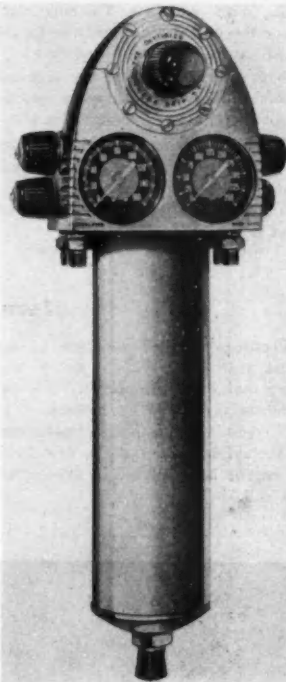
Air Transformer

Model HLD air transformer has a built-in two-stage regulating principle which is said to provide for easy adjustment of pressures. The adjustment knob actuates a small pilot regulator which in turn operates the diaphragm of the large regulator.

The transformer has two regulated air outlets and two unregulated. It has a capacity of 100 cfm. Oil and moisture captured in the condenser tube is drained by a pull-push drain knob.

Corrosion resisting metals are used

in all parts of the condenser chamber which come directly in contact with the compressed air. The head of the transformer housing the regulator, two pressure gages and valves is a zinc die casting, as is the regulator cap. Gaskets at the top and bottom of the condenser chamber prevent leakage. The separating mechanism is a mechanical disk type filter. The diaphragm is made of soft rubber composition with a single fabric insert. De Vilbiss Co.



DeVilbiss air transformer, Model HLD

Circle E-6 on page 81 for more data

Plain or Semi-Automatic Cylinder Grinder

There is currently available to the trade a heavy duty, Type C-2, cylindrical grinder built as a plain or semi-automatic machine in 18 in., 24 in., or 30 in. swing, and in work lengths of 48 in., 72 in., 96 in., 120 in., 144 in., or 168 in. In addition to a fast grinding action, the Type C-2 is said to offer new features that reduce costs by simplifying setup and operation, and by requiring less maintenance.

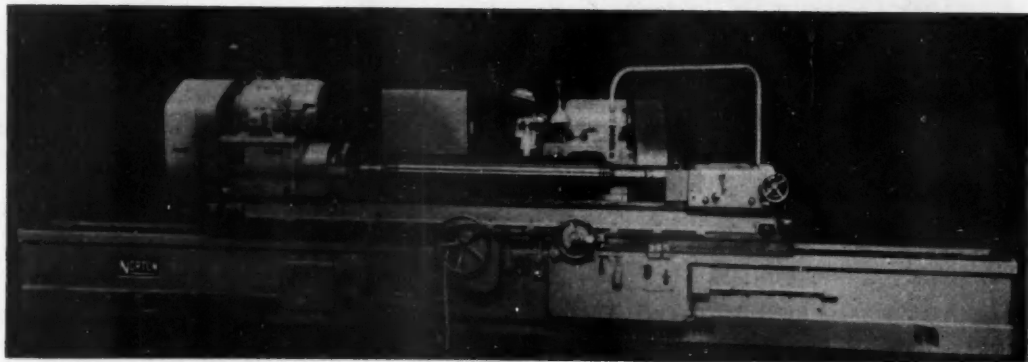
All controls for feeds and speeds are adjusted at the front of the machine in the operating position. It has a combination graduated wheel feed handwheel and "click-count" indexing mechanism which permits settings of 0.0001 in. in work diameter.

It is furnished with a pre-set truing

and grinding speed arrangement. With this feature, table speeds for truing and grinding are independently adjustable and pre-set, and either speed is immediately obtained when desired, by movement of a combination selector and table start-stop lever. Work-jogging control by means of a lever conveniently located near the operating position is also provided.

Other features include automatic or manual control of work rotation and coolant flow, and automatic adjustable wheel feed at table reversals with automatic resetting of the wheel head. Separate dwell controls for each end of table reversal are also provided. Norton Co.

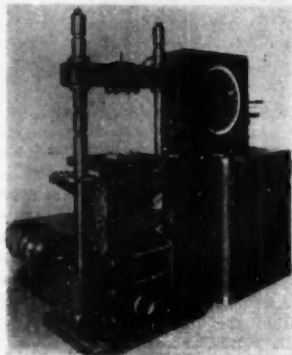
Circle E-7 on page 81 for more data



Norton cylindrical grinder, Type C-2.

Universal Testing Machine

A universal testing machine, incorporating an electric weighing system and electronically - controlled, motor-driven loading mechanism, has been announced. The Model FGT Baldwin-Emery SR-4 testing machine has a capacity of 50,000 lb load and



Baldwin universal testing machine.

is said to have the following characteristics:

1. Weighing and measuring tolerances of 0.2% of reading.
2. High speed response of indicator or recorder to dynamic as well as static loads.
3. Structural stiffness and lateral rigidity.
4. Wide range of loading speeds under precise stepless control. Standard loading speed is 0.025 to 9.0 ipm.
5. Automatic load control for maintaining constant load, constant strain, constant rate of loading, or constant strain rate.
6. Single convenient location for test specimens in both tension and compression tests.
7. Automatic reversals of load, i.e., tension to compression to tension.
8. Quick-acting, semi-automatic operation for "production testing." Printing of critical test values included when desired.
9. Adaptability to stress analysis of parts and components of structures on which SR-4 strain gages or brittle coating techniques are utilized.

Testing machine loads are measured by means of two SR-4 universal load cells of 30,000 lb capacity each, at the base of the two vertical tie rods, and resistance wire strain gage instrumentation of the totalizing circuit type which provides instantaneous response. Three load ranges are provided on a separate indicator with 24-in. diam dial having 1000 grad-

uations in 66 in. of dial travel.

The load system utilizes a single enclosed reversing screw rotated by a two-hp motor under thyatron tube type control over a speed range of 360 to 1. The maximum stroke is eight in. The test table is 20-in.

square. Maximum vertical space is 24 in. for both tension compression tests. Clearance between columns is 21 in. The crosshead is adjusted by means of the main motor drive. Baldwin-Lima-Hamilton.

Circle E-8 on page 81 for more data

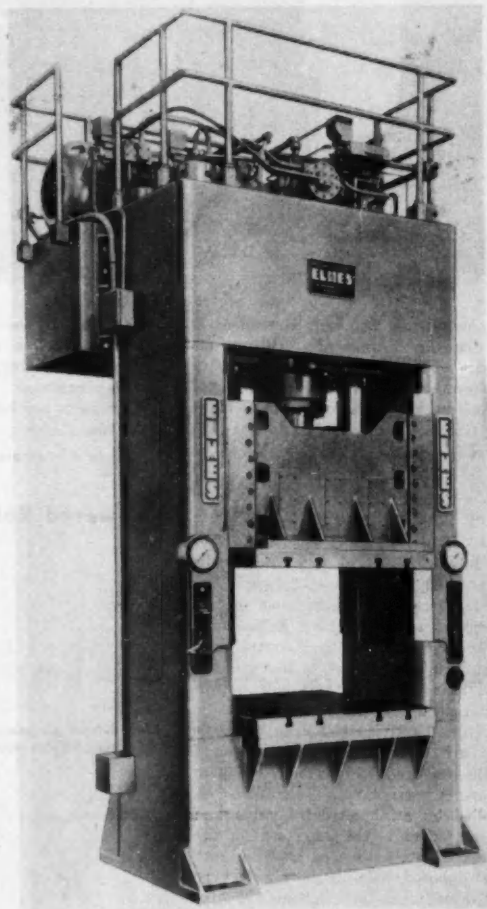
Drawing and Forming Press

A specially built 300 ton hydraulic press has a hydraulic circuit with two pressure cycles in one. Operation is by remote electrical control. There are two foot-switches. The ram is made to exert a low tonnage by activating one foot switch, and a high tonnage by the other foot switch.

The press is arranged for pressure reversal as well as position reversal.

An inching-down handwheel permits moving the platen down 1/16 in. at a time. A safety feature is the thermostat in the reservoir which will automatically stop press operation if the oil should reach a critical temperature. American Steel Foundries, Elmes Engineering Div.

Circle E-9 on page 81 for more data
(Turn to page 78, please)



Elmes 300 ton special hydraulic press.

NEW

EQUIPMENT

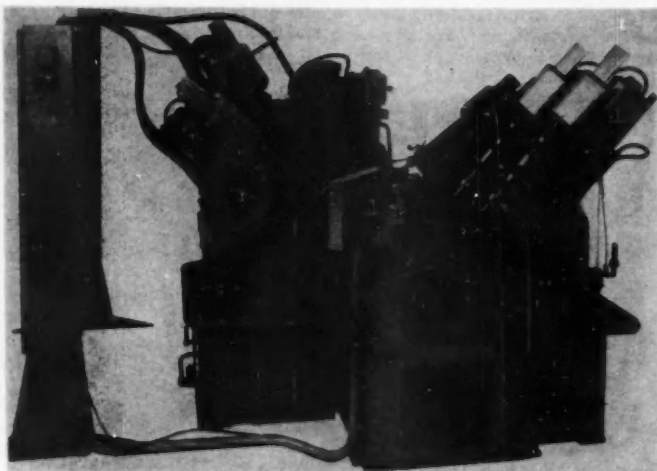
PLANT · PRODUCTION



For additional information, please use postage-free reply card on page 81

(Continued from page 77)

Transfer Machine for Crankshafts

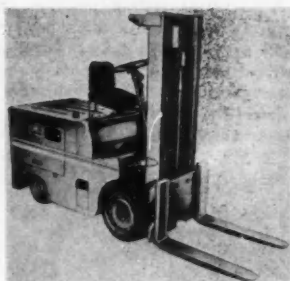


Completion has been announced of a transfer crankshaft drilling machine designed and built to drill lubrication holes in tractor crankshafts. The machine employs Torquematic Control in order to eliminate any possible drill breakage.

Transfer of the crankshaft through the machine is automatic through hydraulic indexing. Production on the above machine approximates 60 crankshafts per hour. *Avey Drilling Machine Co.*

Circle E-10 on page 81 for more data

Industrial Truck



Clark industrial truck, Utilitrac.

For high serviceability in the 6000-to-7000-lb. range, the latest model Utilitrac, gas or electric powered, feature major improvements. Said to be compact in very respect, these trucks have a turning radius well within the limitations of practical aisle widths, and are maneuverable in close quarters. Center-pivoted steering axles, with rubber-mounted bushings and angularly-placed tie-rods, are standard on both power-types.

A new fork mounting is standard on both Utilitrac models. This new mounting is a step toward interchangeability of attachments and devices between all makes of trucks with comparable capacity. Free-lift of 25 in., and more lift is provided.

Travel speed of the electric Utilitrac has been increased to six mph. The lifting speed is 12 percent to 16 percent faster. A large battery compartment permits the use of a wider range of battery sizes. The drive motor and pump are totally enclosed. *Clark Equipment Co.*

Circle E-11 on page 81 for more data

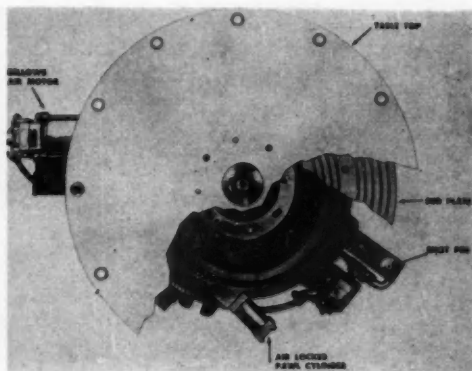
Air-Powered Rotary Index Table

Called BRET-26, an electrically controlled, air-powered rotary index table has a 26-in. diam table top rotated by a 3½-in. bore Bellows air motor with full electrical control. The standard table is set to index either six, nine or 18 stations with repeat index accuracy of ± 0.001 .

Around the perimeter of the table top are 18 equally spaced, jigbored holes—tapered and bushed to ¼ in. diam. An auxiliary air cylinder, controlled by an Electroaire valve and synchronized to the movement of the table, drives a tapered shot-pin into the jigbored hole, positively locking the table in position. *Bellows Co.*

Circle E-12 on page 81 for more data

Bellows air powered rotary index table.



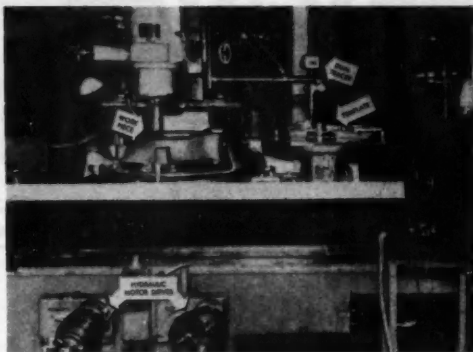
Automatic Duplicating Machine for Mills and Lathes

A device for the automatic duplication of machined internal and external profiles and contours is known as the Lodge & Shipley Duplicator. It is for use on mills and lathes.

The Duplicator is said to accurately control two feeds of the machine for reproducing from a template, original model, or work piece compound curves as well as 90 deg shoulders. It acts as an attachment to the machine and does not interfere when the machine is used on work that does not require automatic duplication. It can be moved from machine to machine as the need arises. *Tracer Control Co.*

Circle K-13 on page 81 for more data

Tracer Control, Lodge & Shipley Duplicator.



450 Ton Double Action Straight Side Press

A 450 ton double action straight side press, recently produced, incorporates some interesting features of double action press design. This press is equipped with a Dynamatic clutch which varies the linear stroking speed during the press cycle. It operates at the comparatively fast rate of 14 strokes a min. This overall stroking rate is accomplished by accelerating the part of the cycle not actually involved in the drawing work. Slide speed during the effective draw is held to the desirably slow speed of 60 1/4 fpm.

Motor adjustments to both the inner and outer slides are provided. In addition, the outer slide, or blankholder, has a provision for a 1/4 in. pinch adjustment which can be made at each corner of the blankholder. This feature enables the press user to vary the blankholding pressure at the corners to allow for uneven draws.

A further construction feature on this press is the central lubrication system. An oil pump and filter unit distributes oil to all working members of the drive. Oil is piped under pressure to the bearings of the flywheel and driveshaft, which are anti-friction, as well as to gear teeth. Slide connections are also lubricated from this central system. An oil pressure safety switch monitors the oil lines to the pressure lubricated bearings of the flywheel and driveshaft so that if any one of these lines should become clogged, the press stops automatically and the switch indicates the faulty line.

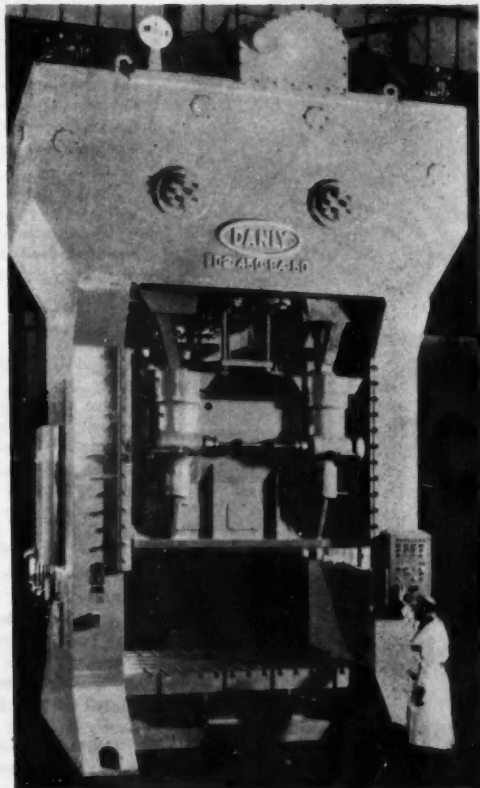
An unusual feature of this press is the design of the bed. Specially engineered, the bed meets prescribed

limits of deflection and at the same time is built shallow enough to be installed without a pit. Resting directly on the floor, the bed is shallow enough

so that loading and unloading are carried on at the proper level. *Danly Machine Specialties, Inc.*

Circle K-14 on page 81 for more data

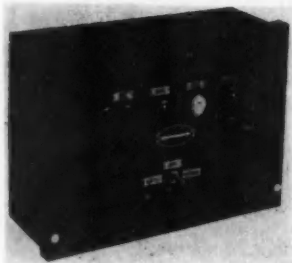
Danly double-action press of 450 ton capacity.



NEW

PRODUCTS.

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 81



Automatic Engine Controls

Now available in a line of automatic engine controls is Model 2100 IO G. This control set enables automatic starting and stopping from any type of pilot switch.

Safety protection is provided by automatic shutdown of engine and four directive signals to indicate any trouble such as: low oil pressure,

overheating, failure of engine to start, or excessive water jacket temperature.

Engine operation either as a prime source of power, or as emergency source should the prime source fail, is said to be assured. *Synchro-Start Products, Inc.*

Circle P-5 on page 81 for more data



Pocket-Size Volt-Ammeter

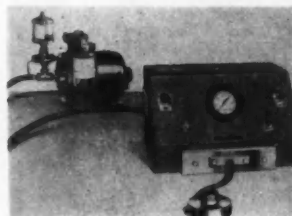
Recently introduced is a pocket-size volt-ammeter with nine ranges up to 300 amp and 60 v. Known as the Amprobe "300," the instrument is of the "snap-around" type, which is said to enable the user to measure current instantly without shutting down equipment or making ammeter connections.

Voltage test leads are equipped with new retractable safety plug, which automatically insulates itself when removed from meter. Jaws are completely insulated down into the

sockets to protect against shorts and shocks. Probe jaws are pointed for working in crowded switch and terminal boxes.

Some of the unit's uses are: determining load conditions, checking motor overloads, balancing loads, locating grounds, tracing shorts, start and run currents, relay settings, checking open windings in motors, checking voltage losses, and checking out controllers. *Pyramid Instrument Corp.*

Circle P-6 on page 81 for more data



Versatile Vacuum Tester

Recently marketed is a new vacuum tester that can test numerous automotive and aircraft parts. Tests reportedly can be run to reveal porosity or surface fissures, or to "prove" lapped surfaces, ground surfaces, or surface flatness. The unit is also said to test effective sealing of complete assemblies and the efficiency of air

cylinders, if the user so desires.

The compact tester is portable and comprises a vacuum pump and an instrument panel with an attached testing plate. Plate size and composition are standard, but both may be varied to meet specific testing requirements. *Gits Bros. Manufacturing Co.*

Circle P-7 on page 81 for more data



Button-Locking Door Lock

Now available is a type of lock that is said to replace the door lock button. The car ignition key unlocks the door lock, but locking is accomplished without the use of the key by merely pressing a small button.

The lock is selective, since normal operation remains the same as press-

ing down the door button with which the car was originally equipped. It is particularly recommended for use on the rear doors of four-door cars to keep children from falling out. *Semco Research, Inc.*

Circle P-8 on page 81 for more data
(Turn to page 120, please)

Free INFORMATION SERVICE

Postage-Free Postcards Are Provided Here for Your Convenience to Obtain FREE LITERATURE and Additional Information on NEW PRODUCTION AND PLANT EQUIPMENT, AND NEW PRODUCTS Described in This Issue of AUTOMOTIVE INDUSTRIES. Please Circle Code Numbers of Items in Which You Are Interested, Print Name, etc., and Mail Promptly for Quicker Service.

USE THIS POSTCARD

FREE LITERATURE

Optical Comparators

Catalog No. 402 outlines the basic principles of optical comparators for speedy and accurate measurement and inspection and gives detailed data on J & L units and their operation. *Jones & Lamson Machine Co.*

Circle L-1 on postcard for free copy

Wires and Cables

Now available is a 186-page catalog of more than 500 different types of wires and cables. It contains data on construction and operating characteristics for numerous products. A technical engineering data section is also included. *U. S. Rubber Co.*

Circle L-2 on postcard for free copy

Flowmeter and Tachometer

Recently released is Bulletin No. 1050 on an electronic flowmeter and tachometer for measuring the flow of fluids, corrosive liquids, gases, acids, and liquid oxygen. *Potter Aeronautical Co.*

Circle L-3 on postcard for free copy

Loudspeakers

An illustrated catalog called "Technilog" explains and simplifies the application of a line of loudspeakers. Included are numerous types for use in industrial plants. *University Loudspeakers, Inc.*

Circle L-4 on postcard for free copy

Spring Steels

Catalog No. 50 presents detailed data on a complete line of cold rolled spring steels for numerous applications. Specification tables are included. *Sandvik Steel, Inc.*

Circle L-5 on postcard for free copy

Drill Grinder

A four-page brochure describes the Dumore small diameter drill grinder. This unit is said to eliminate completely hand sharpening of small drills—No. 70 to ¼ in. *The Dumore Co.*

Circle L-6 on postcard for free copy

Die Steels

Data on the selection and use of Desegatized H1 Carbon-H1 Chromium die steels is featured in an illustrated bulletin now available. *Latrobe Steel Co.*

Circle L-7 on postcard for free copy

Speed Reducers

Bulletin A-614-A offers engineering information and selection data on a line of speed reducers and an overload release, designed for use with the reducers. This series of shaft-mounted reducers covers a speed range of 12 to 330 rpm. *Dodge Manufacturing Corp.*

Circle L-8 on postcard for free copy

(Please turn page)

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NEW PRODUCTS

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Stamping Techniques

"How Modern Stamping Techniques Can Help Conversion" is the title of a 28-page booklet. Numerous illustrations of metal stampings are included. *The Leake Stamping Co.*

Circle L-9 on postcard for free copy

Rotary Shelving

Discussed in a 16-page catalog is the use of Rotabin rotary shelving to store parts, tools, and materials more efficiently in tool or supply rooms of manufacturing plants. *Frick-Gallagher Manufacturing Co.*

Circle L-10 on postcard for free copy

Fuels and Lubricants

Vol. 38, No. 8 of "Lubrication" contains Part I of an informative article on fuel and lubricants for the modern bus and truck. *The Texas Co.*

Circle L-11 on postcard for free copy

Oil Filtration

The first of two four-page bulletins now available describes how automatic filtration and handling equipment keeps oils and coolants in good operating condition and presents the Honan-Crane line. The other discusses and illustrates typical installations. *Honan-Crane Corp.*

Circle L-12 on postcard for free copy

X-Ray Equipment

Seven types of X-ray equipment for industrial application are described in a four-page folder (B-4787). *Westinghouse Electric Corp.*

Circle L-13 on postcard for free copy

Gas Combustion

The story of gas combustion and the growth of a large manufacturing organization built around its diversified applications is told in a booklet entitled "Heat in Harness." *Surface Combustion Corp.*

Circle L-15 on postcard for free copy

Reamers and Holders

Circular No. 552 covers a line of stub screw machine reamers and floating holders. Ranges of the former in inches are listed, and sizes and capacities of the latter are tabulated. *Pratt & Whitney Div., Niles-Bement-Pond Co.*

Circle L-16 on postcard for free copy

Parts and Fasteners

Just released is an eight-page illustrated booklet that describes the flexibility of the Camcar cold-flow technique for low-cost, high-volume supply of special parts and fasteners. *Camcar Screw & Mfg. Corp.*

Circle L-17 on postcard for free copy

Finishing Machines

Now available is a general catalog containing detailed descriptions of the Heald Bore-Matic line as well as full information on internal and rotary surface grinding machines. *The Heald Machine Co.*

Circle L-18 on postcard for free copy

Welding Electrodes

A 49-page booklet (GED-1634), describes the application, chemical analysis, and mechanical properties of GE welding electrodes. *General Electric Co.*

Circle L-19 on postcard for free copy

Controlled Pressure

Vol. 3, No. 5 of "The Denison Press" contains a special article on the design and operation of the pressure control feature embodied in the Multipress machine. *Denison Engineering Co.*

Circle L-20 on postcard for free copy

Propane Fuel

Now available is a limited supply of reprints of an article entitled "The Economics of Propane as an Engine Fuel." *Automotive Industries.*

Circle L-21 on postcard for free copy
(See preceding page)

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Please send me additional free information on the items described in the issue of AUTOMOTIVE INDUSTRIES, the code numbers of which I have circled below:

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L-1 L-7 L-13 L-19	E-1 E-7 E-13 E-19	P-1 P-7 P-13 P-19
L-2 L-8 L-14 L-20	E-2 E-8 E-14 E-20	P-2 P-8 P-14 P-20
L-3 L-9 L-15 L-21	E-3 E-9 E-15 E-21	P-3 P-9 P-15 P-21
L-4 L-10 L-16 L-22	E-4 E-10 E-16 E-22	P-4 P-10 P-16 P-22
L-5 L-11 L-17 L-23	E-5 E-11 E-17 E-23	P-5 P-11 P-17 P-23
L-6 L-12 L-18 L-24	E-6 E-12 E-18 E-24	P-6 P-12 P-18 P-24
		P-7 P-13 P-19 P-25
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USE THIS POSTCARD

Temperature-Humidity Chambers

A line of temperature-humidity chambers with program control for meeting all Government specifications is featured in a four-page brochure. Uniform wet and dry-bulb temperatures are said to be maintained throughout the chambers by a continuous forced flow of conditioned air. *Tenney Engineering, Inc.*

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for Greater Operating Economy

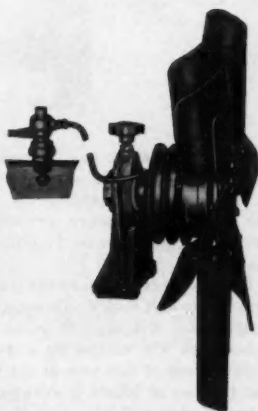
All of our products for your Diesel engines are engineered for your particular application and requirements. More than one-third of a century of research, intensive engineering, broad field experience with unexcelled manufacturing facilities are back of our products. We gladly offer our engineering assistance and our extensive facilities to produce and serve you efficiently.



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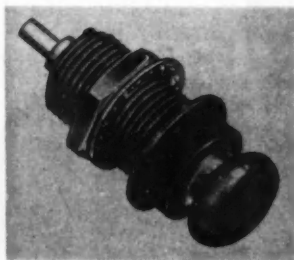
FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 81

Indicator Light

An indicator light for edge-lit AN-P-89 aircraft panels is known as the Hetherington Type L2000. The light flange mounts on the backup plate and the socket extends through the edge-lit panel. The plastic lens screws into the light socket from the front of the panel.

The light is 1 1/4 in. long overall, weighs less than 1/4 oz., and is of nickel-plated brass finished in black to match standard edge-lit panels. A 327 miniature lamp is used for six, 12, or 28-v operation, and amber, blue, green, red or white plastic lens are available. Molded-in terminal will not vibrate or pull loose. Hetherington, Inc.

Circle P-1 on page 81 for more data



Hetherington indicator light.

Sealed Relay

Now on the market is a hermetically-sealed aircraft relay No. A52-111, rated 10 amp, dpdt, 28 v, or 115 v, 400 c ac. Weighing 4.8 oz, it is claimed to be one of the smallest and lightest available for its rating. Enclosure measures 2 1/16 in. by 1 13/16 in. by 1 9/16 in. and has individual terminal lugs. Base has mounting holes on 2 3/4 in. centers.

The relay utilizes the identical rotary armature structure and is designed to satisfy the requirements of Specification MIL-R-6106. It has reportedly been vibration-tested for one



Electrical Products relay.

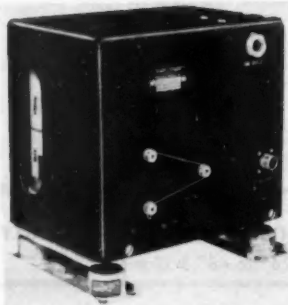
million c of operation, and has been found free of resonance over frequencies between five and 200 cps, with amplitudes varied to hold five G. Electrical Products Corp.

Circle P-2 on page 81 for more data

Pressurizing Kit

Incorporating dry-air components, a pressurizing kit is specifically used to prevent cavitation in engine-driven hydraulic pumps by compressing air in the oil tank. It is said to operate efficiently at high altitudes, with capacity of 100 cu in. per min at 35,000 ft.

Intermittent operation is fully



Lear pressurizing kit.

automatic. Pressure switch is set to start pumping at seven to eight psig and to stop pumping at 9.75 psi maximum. Electrical receptacle connects to 27 d-c power source.

The kit comprises a 30 cu in. silica gel dehydrator and a Type Q-1 air compressor. A check valve is the outlet port prevents back flow when the pump is stopped. The pump is constructed of self-lubricating parts. Total weight of the unit is only 9.5 lb. Lear, Inc., Romee Div.

Circle P-3 on page 81 for more data

Weather-Proof Switch

Compact, weather and oil-proof push button electric switches that weigh one ounce are in production. The double-pole, double throw assem-



Micro-Switch weather-proof switch.

bly is small enough, as a comparative measure, to fit inside a walnut shell.

The movement required to operate these subminiature snap-acting switches is provided by resilience of the seal.


Underwriters' Laboratories list both single and double pole switch assemblies for five amp 20 v a-c, and either type will control 30 v d-c inductive loads of two amp at sea level, and 1 1/2 amp at 50,000 ft elevation.

Installation and wiring of the new switch is accomplished by snap removal and replacement of switch elements in mounting brackets. Micro-Switch, Div. Minneapolis-Honeywell Regulator Co.

Circle P-4 on page 81 for more data

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METALS

Copper Company Executives Denounce Washington Controls as Autocratic. Lead and Zinc Supplies Are Satisfactory

By William F. Boericke

Steel Makes Fast Recovery

The recovery in steel production in August to an output of 8,490,000 tons, the highest monthly production since March, was an amazing achievement and metal users now are less concerned about the supply situation. Government control agencies have switched from pessimism to qualified optimism over the outlook. Chief Defense Mobilizer Steelman, quoted originally as saying that some of the effects of the steel strike would be felt for a year, has now said that full production of industries most affected by the strike were approaching maximum output much more rapidly than expected.

With present production exceeding 100 per cent of capacity, the \$64 question is how long can it continue at this rate. In retrospect it was generally conceded in the trade that production would have dropped to 85 per cent of capacity by the fourth quarter if the strike had not intervened. Best opinion now is that the steel shortage will continue for the rest of 1952 but supply will catch up with demand by the first quarter of 1953.

Careful inquiry discloses that steel consumers are eager to get all the steel possible for quick delivery, but are less anxious to contract ahead for long periods and particularly at high prices. Conversion steel isn't wanted after next January. Inventories are still out of balance. Certain types of steel are rapidly coming into relatively easy supply, notably merchant bars and specialty steels. On the other hand demand is good and likely to remain so for heavy plates and structural steel, oil country goods and especially nickel-bearing alloys and stainless steels, except chromium stainless. Scrap supplies are abundant, but are expected to tighten seasonally toward the end of the year.

It should be noted that of the Government's major expansion programs for the metals, steel has made the most progress toward its objective of 123 million tons capacity by 1954. Only 50 per cent of the 25 million tons additional capacity remains to be completed. It's now pretty clear that all of the new capacity will not be needed for both a guns and butter economy. Theoretically this means some idle, or standby capacity. But an 85 per cent operating rate would actually be more economic for the industry than the present over-capacity rate as it would mean that obsolete equipment could be retired and the \$3 billion spent for new equipment and construction in the last six years could prove its worth in operating economies.

Export prices of European steel products have been cut \$5 to \$15 per ton and immediate delivery is prom-

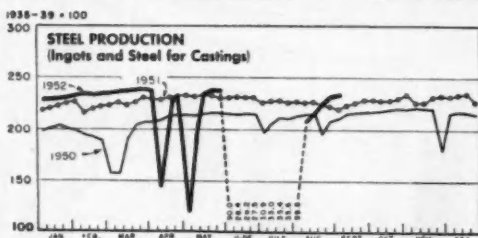
ised. Free European steel output has steadily increased and is expected to produce 72 million tons in 1953. There will be plenty of competition in foreign markets next year for domestic steel producers.

Dissatisfaction With Copper Price

The situation in the copper industry continues to present a picture of confusion with inconsistencies in the prices established in Washington that evoke comments from copper company executives, who were contacted before this article was written, that are frankly unprintable. The chairman of the board of Anaconda Copper Co. castigated the autocratic controls imposed on domestic copper producers by Washington and quoted with approval from a recent editorial in the leading trade paper to the effect that never has there been a time when the Government's treatment of the copper industry has been so outrageously unfair and so completely nonsensical as it has been in recent weeks.

Resentment is widespread against the 24½ cent price for domestic copper producers while foreign miners enjoy 36 cents or whatever they can get.

Selected Business Indicator



Source: U. S. Dept. of Commerce

Workers in the copper industry were granted a wage hike of eight cents an hour with fringe benefits in September, which averted a strike and made it probable there would be no interruption to domestic output in the foreseeable future. This was all to the good, but at this writing there has been no compensating price increase for copper metal granted from Washington as was done for the aluminum producers and the steel men.

However, some indication appears that the price ceiling soon may crack. Calumet & Hecla, a high cost
(Turn to page 114, please)

JOE STALIN: **LAY OFF!**



Seems like every time we pick up a newspaper, you're claiming credit for someone else's inventions. So, for the record—here's a list of 21 Gisholt Turret Lathe "firsts" that date back as far as

1889. Practically all of 'em are standard on good turret lathes today. And every one of these was "invented" right here in Madison, Wisconsin, U.S.A. So don't try to claim that you "did it first."

1. First heavy turret lathe for chucking work.

2. First geared headstock on turret lathe—provided three speed changes without shifting belts on cone pulleys.

3. First turret lathe with independent power feed cross slide carriage.

4. First saddle type turret.

5. First multiple tooling of chucking work with combination facing and turning heads and pilot arbor support for added accuracy and rigidity.

6. First chucking turret lathe equipped for thread chasing with lead screw.

7. First headstock cast integral with bed.

8. First turret lathe with power feed for cross slide.

9. First cross feeding hexagon turret.

10. First power rapid traverse for hexagon turret carriage.

11. First turret lathe with built-in individual motor drive.

12. First power rapid traverse for cross slide carriage.

13. First taper attachment for cross sliding hexagon turret.

14. First use of automatic force feed lubrication on a turret lathe.

15. First automatic spindle brake.

16. First quick indexing and automatic clamping of square turret on cross slide.

17. First turret lathe aprons fully enclosed and run in oil bath.

18. First use of antifriction bearings throughout entire machine.

19. First rapid traverse for cross slide.

20. First turret lathe with hardened steel ways.

21. First automatic pressure lubrication of ways.

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Observations

By Joseph Geschelin

Twelve Volts

Just because we have not said anything about it lately, we must not forget to emphasize that 12-volt electrical systems for passenger cars are pretty well in the bag for 1953 models. In fact, we expect 12-volt systems on at least four different makes of cars. This shift, moderate though it may be, will require new electrical testing equipment as a matter of course. Once the new system is under way, we can expect more and more cars to swing over as time goes on.

Power Steering

Power steering is gathering adherents as well as suppliers. Although only Gemmer and Saginaw have been producing for passenger cars, others are making preparations. Monroe Auto Equipment has a simplified job which, we understand, is being tested by at least one manufacturer; and we hear of still another prominent parts maker with power steering up his sleeve. If demand has an effect on reducing the cost of the system, motorists generally will find a lot of comfort and safety in power steering.

What's New

According to "Casting the News," published by Campbell, Wyant and Cannon, the ancient Egyptians not only built pyramids but were among the first foundry workers to practice cope, drag, and core molding. They also experimented with the smelting and forging of iron, and are claimed to be the inventors of the lost-wax molding process, a development finding wide use in our time.

Copper Saving

The experts tell us that widespread introduction of 12-volt electrical systems for motor cars holds promise of worthwhile savings in copper. Major savings is in the wiring

harness. In current practice wiring harnesses require, on the average, from three to four lb of copper. In a 12-volt system there is a possibility of reducing copper content by as much as 1.25 to two lb. Net saving in the electrical elements and accessories is not as great but may amount to $\frac{1}{2}$ lb. Naturally, the full benefits of copper conservation could not be realized for a long time, at least not before all motor car production had been converted to 12-volt.

Wire Wheels

There is no doubt about a revival of interest in wire wheels. True they are being exploited exclusively on sport cars, and although volume is not large there are a lot of makes on the market. Among these are: Buick, Packard, possibly Chrysler, Nash-Healey. Too, there are the foreign makes such as Jaguar, MG and others which may require service in the U. S. Added to these are the cars built for domestic race tracks, particularly for Indianapolis. If enough of these sport cars get around, who knows but that some car buyers may want wire wheels as optional equipment. One of the experts in this field tells us that he believes that wire wheels may offer a solution to the brake cooling prob-

lem. At any rate these points are well worth some investigation.

Crowding Developments

Between now and the first of 1954 we anticipate new developments of interest to everyone in the industry. Among these are: at least two added starters in motor car V-8's; a loop-scavenged Diesel engine; at least one new tractor engine to be built with transfer machine equipment. In addition, there should be at least two new automatic drives, currently under wraps.

Air Conditioning

We have talked about it for years. Now we know for sure that Frigidaire will have car air conditioning on Oldsmobile and Cadillac, and Chrysler will offer an Airtemp unit. Needless to say, Kelvinator has been readying an air conditioning system of its own, but it is not likely that Nash cars will offer this in 1953. Of course, these devices cost money, more than any other optional device such as an automatic transmission or power steering. But the cost, whatever it may be, will be justified in the areas where driving is tough because of high temperatures.

Chemical Group Sees Engine Wear Display

A display "Reduction of Wear in Automobile Engines" was selected for presentation by the Chicago section of the American Chemical Society at the National Chemical Exposition at Chicago, Ill., Sept. 9-13.

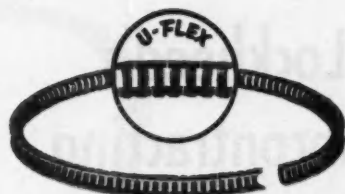
Investigations by the International Nickel Co., which prepared the exhibit, show that most wear in engine cylinders is the result of corrosion. By operating the engine at temperatures above the dew point of the products of combustion, wear can be reduced.

At temperatures below 190 F wear can be reduced by materially increas-

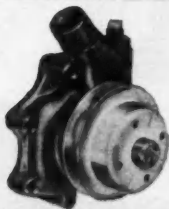
ing the quantity of oil supplied to the cylinder walls. Neutralizers and inhibitors in the lubricant and something that will make the lubricant cling to and preferentially wet the cylinder walls in the presence of large volumes of condensate will improve the action of the lubricant and also reduce wear.

A practical solution appears to be the use of corrosion resisting alloys such as Ni-Resist, a 20% nickel-chromium cast iron, for cylinder liners and piston rings. The display pointed out that under road conditions ranging from taxicab and light bus service to sustained heavy-load trucking, Ni-Resist wears from 10 to 20 times better than cast iron.

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U-FLEX OIL CONTROL PISTON RING



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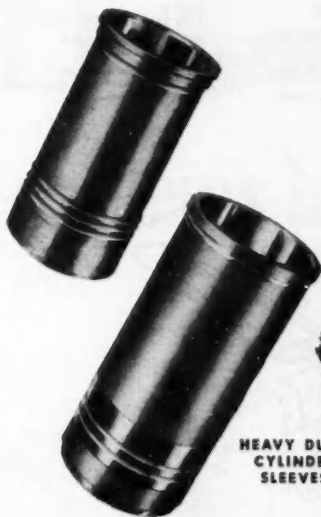
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From screw caps in 1901, Thompson's versatility has grown to include such vital engine parts as piston pins for powerful, dependable aircraft; valve seat inserts for rugged bulldog tanks; cylinder sleeves to stand up in toughest heavy-duty service; pumps to cool your product or your engine and the revolutionary, new U-Flex Oil Control Piston Ring.

Thompson is versatile! But more important, every one of Thompson's hundreds of automotive and aircraft parts have the reputation of being produced to the closest tolerances known to the industry. Automotive builders and repairmen agree, "The name Thompson means original equipment precision parts that you can take for granted." They know "You can count on Thompson" for dependability of supply, quality, exact tolerances and maximum performance and service.

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SPECIAL PRODUCTS DIVISION

Lockheed's Subcontracting Program

PARTS and units made by subcontractors account for 51 per cent of the P2V antisubmarine bomber manufactured by Lockheed Aircraft Corp. The \$255 million subcontracting program accounts for more than half of Lockheed's total of \$456 million purchasing commitments divide among 4000 suppliers.

Components of the P2V-5 bomber supplied by subcontractors and by the Government are shown on the breakaway drawing. Dotted lines indicate key forward fuselage and center sections built by Lockheed. The other sections, including those furnished by the Government, are assembled before being shipped to Lockheed's Burbank plants. Landing gear is a purchased item, not subcontracted.



Subcontractor-manufactured wing for Lockheed T-33 jet trainer is shown being unloaded from specially fitted trailer which hauls it from the Beech Aircraft Corp. factory in Wichita to the Lockheed plant at Van Nuys, California. Note how top of 42-ft trailer, which holds four of these wings, opens for vertical unloading. The center section of the 12-ft high trailer has a well only 10 in. from ground to accommodate ailerons and flaps.

Chance Vought
Empennage and aft fuselage section consisting of . . .

1. Horizontal stabilizer assem.
2. Vertical fin assem.
3. Elevators and tab assem.
4. Rudder and tab assem.
5. Aft fuselage sect. assem.

P2V-5 ANTISUBMARINE BOMBER

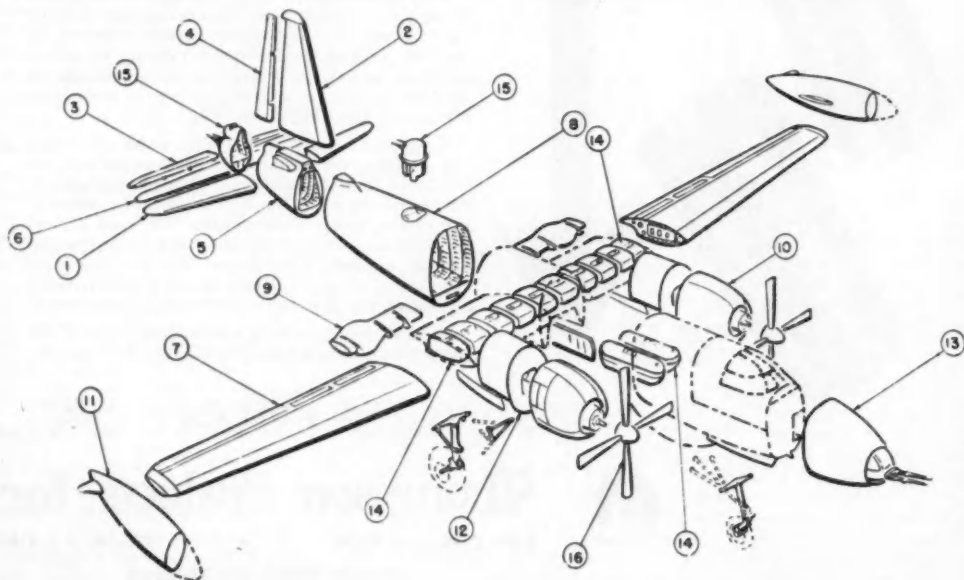
6. Varicam assem.
Tosco Eng. & Mfg. Co.
7. Outer wing assem. incl. tips.
Kaiser Mfg.
8. Waist body structure.

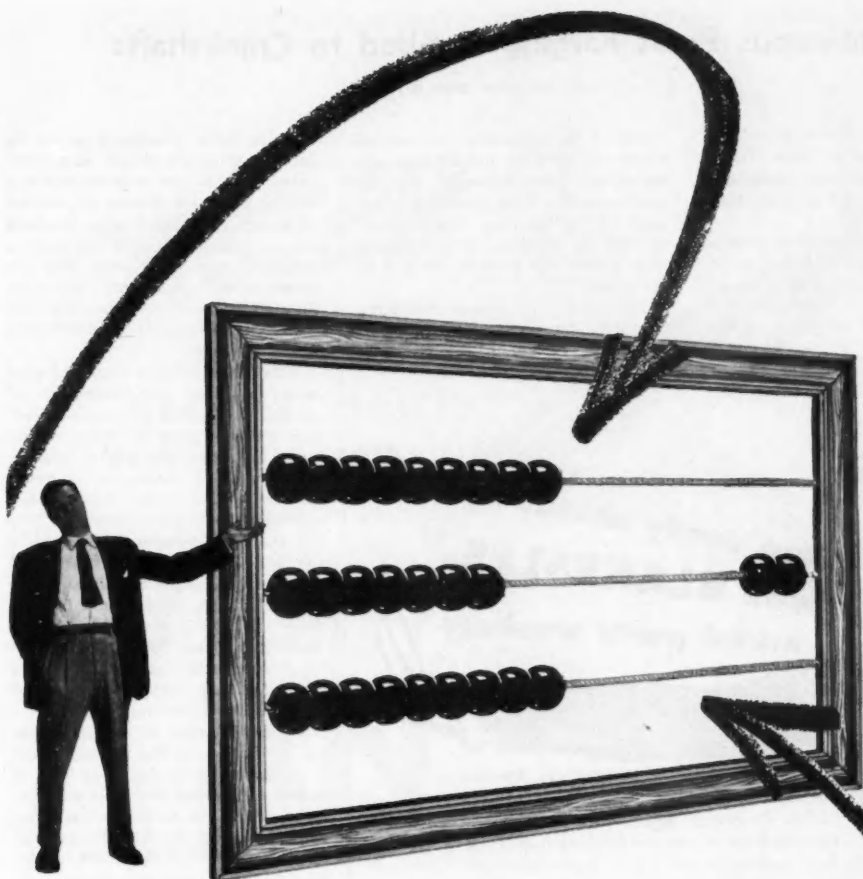
9. Center sect. flaps.
Rohr
10. Power Plants
11. Wing tip nacelles
Solar
12. Nacelle barrels

Rheem
13. Fuselage nose assem.

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Continuous Press Forging Applied to Crankshafts

(Continued from page 59)

capable of producing at least 150 V-8 crankshaft forgings an hour. Dodge has on order additional equipment, and contemplates three such lines eventually.

Now that a full scale mass production operation is available for study, it is possible to appraise some of the advantages of press forging. From the time of receipt of billets in mill

lengths, the operation is entirely automatic, fully mechanized and conveyorized, with conveyor transfer mechanism and other devices to eliminate manual handling. As a matter of fact, the operation is intermittent only where the work is handled in the presses.

The setup is even more significant from the standpoint of the workers.

For one thing, practically all of the heavy manual effort has been eliminated. This is even more marked in a forging operation because of the ease of manipulating the forging in closed dies as compared with the intense physical effort and hand skill involved in hammer forging. Moreover, through mechanization the entire operation has been made safer and more nearly foolproof.

What about relative quality? Dodge says that from the standpoint of physical properties and grain structure there is little to choose as between hammer and press forging. The important advantage of press forging is that every stage of the mechanized process is subject to better and more precise control, while the operation of the press is divorced from operator skills or defects. Consequently, press forgings can be produced more uniformly and more consistently to size. This is of utmost importance in the machine shop since it implies less metal removal and more consistent tooling practice.

Without placing an evaluation on the importance of the various items of equipment to be described here, it is safe to say that the basic machine about which the technique has been built is the 6000-ton Ajax mechanical forging press. It is capable of 35 strokes per minute, and weighs one-million lb.

The operation starts with steel billets, of SAE 1045 steel, four-in. and 4½-in. round-cornered squares, stored in the yard, which are lifted by a magnetic crane into a rack, then are pushed through an opening in the wall by means of a hydraulic cylinder into a warming furnace. This is used primarily in cold weather to heat billets to around 400 F, although some billets are heated at all seasons when necessary to prevent cracks during shearing.

Upon emerging from the furnace the billets drop onto a power driven conveyor, moving them to a No. 15 shear, actuated by a trip. The shear cuts forging billets ranging in weight from 106 to 125 lb, depending upon the size of the crankshaft. A transfer mechanism automatically moves the billets onto another conveyor for transport to the 32-ft diameter Hagan rotary heating furnace.

This furnace is provided with two automatic stations—one for loading, the other for unloading. The loading



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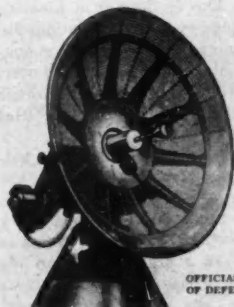
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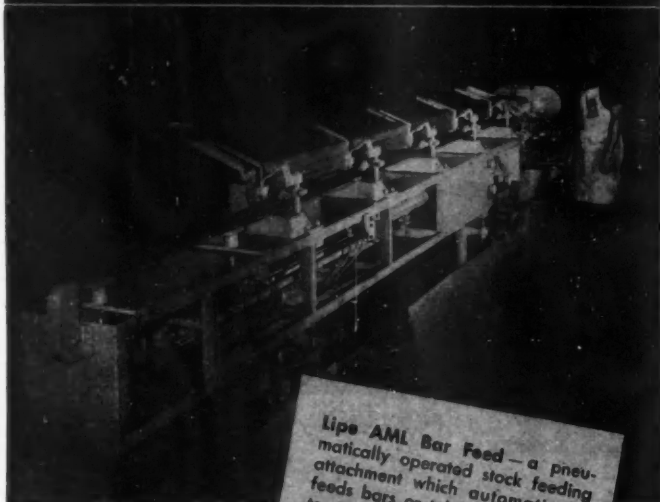
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Automatic Magazine Loading BAR FEED

ELIMINATES FEED FINGERS—A pusher rod *behind* the stock feeds it through the collet. Abolishes feed fingers—saves feed finger replacement and repairs.

ELIMINATES REJECTS—Other than the collet, nothing grips the bar. There's no feed finger scratching, marring or deforming of highly polished stock.

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Lipe AML Bar Feed will enable your screw machine to produce at least 90% of its gross geared production capacity.



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Manufacturers of Automotive Clutches and Machine Tools
Syracuse 1, N. Y.

Forging Crankshafts

(Continued from page 92)

arm picks billets from the traveling conveyor and deposits them on the hearth; the unloader removes the heated billet and drops it onto the conveyor leading to the forging press. Loading can be preset to handle up to 300 billets per hour. The Hagan furnace is gas-started and oil fired. Temperature is maintained between 2250 and 2300 F. The heating cycle takes about an hour.

After unloading, the heated billets slide by gravity to a turntable and are then conveyed through a four-jet water descaler, operating with water at a pressure of around 2030 psi. Descaled billets are transported to a trip which actuates a National roll-reducer to provide a properly pre-formed blank. As the billet leaves the reducer it intercepts a photocell beam actuating an air-driven piston, turning it 180 deg, and placing it in proper position for the press die. A conveyor completes the transport into the press bed.

The major operation is in the 6000-ton Ajax press. This is fitted with a two-station closed die, requiring but one strike in each position. The forging now is transported to a small Clearing press for removing the flash, the forging being pushed out of the trim press by an air cylinder.

The operator then picks up the part with a tong, and aided by an overhead trolley, carries the forging to a four-in. Ajax upsetter where the flange is forged to shape. Since V-8 crankshafts are forged with throws all in one plane the next operation is that of twisting to properly align the crankpins. This is done in a Clearing press fitted with a specially designed hydraulically operated twisting fixture.

The final operation in this area is restrike. This is done in a Clearing press fitted with a two-station die. At this point the forgings are mounted on an intermittently-operated overhead conveyor for transport through an air cooling zone, then to heat treatment.

Heat treating is handled in a battery of two Holcroft furnaces, one for water-quenching outside the furnace; the other for tempering. Work is transported through the furnaces on a two-row overhead conveyor line fitted with carriers each holding four forgings. Thus eight shaft are car-



**Ex-Cell-O Style 1212-A
Precision Boring Machine**

Maximum Flexibility

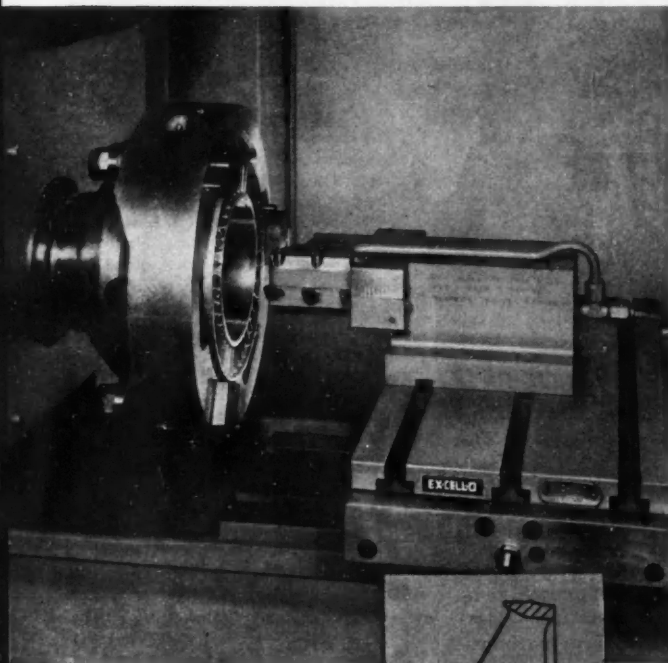
WITH MINIMUM TOOLING

Standard Ex-Cell-O Machine Bores, Grooves, and Faces

It's advantageous to use standard machines and standard items of tooling whenever possible. You cut engineering time, save money, and get your machine sooner.

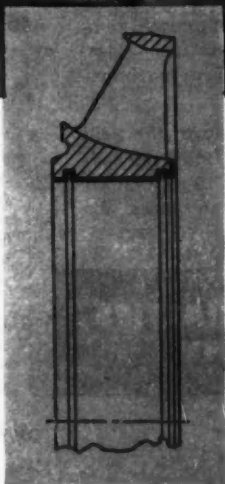
The set-up illustrated handles several operations on two similar aluminum tank transmission parts with a minimum of special tooling. Machine, hydraulically operated cross slide, spindle, spindle bridge, motor bridge, and control equipment are all standard items. Only the chuck and tool block are special.

Here is a typical example of the flexibility and economy that are yours with Ex-Cell-O Precision Boring Machines. See your local Ex-Cell-O representative or contact Ex-Cell-O in Detroit.



View of tooling set-up for rough- and finish-boring, counterboring, grooving and facing of tank parts.

Sectional view showing operations in heavy lines.



EX-CELL-O

Forging Crankshafts

(Continued from page 94)

ried in each stage. Altogether the furnaces are arranged to handle 152 shaft per hour, the size of the work ranging from 62 to 90 lb. The hardening furnace is held to a temperature of 1550 F, length of the cycle being 100 minutes. Upon emerging from the furnace the carriers are lowered to immerse the work for

about 70 sec in a tank of water held at 90 F.

An elevator raises the carriers from the quench tank back to the conveyor for transport into the gas-fired Holcroft tempering furnace. Tempering is done at 1125 F, cycle time being 120 min.

Upon emerging from this furnace the forgings are lowered into a water tank for cooling, then raised and returned to the monorail for movement to the shot blasting machine. After shot blasting, forgings are transferred manually, with the aid of an

air hoist, to another conveyor line leading to the machine line for centering. In addition, each shaft is straightened in a press to static balance on live centers.

A noteworthy feature of the setup is the service tunnel under the press line. It serves three separate functions. First of all it houses the scrap conveyor which carries the flash and other scrap out to the yard where it is stored for loading into cars. Later the carload lots are transported to the Dodge foundry.

In addition the tunnel houses two duct lines—one carrying fresh air under pressure from blowers on the roof; the other, an exhaust duct for removing fumes and heated air around the forging presses. In the interest of worker comfort the pressurized fresh air is delivered to the various stations and forced out through man-cooler vents, instead of the old fashioned fans. It is not only a more pleasant way of receiving fresh air; it is also considerably safer.

Another item of interest to forge management is that of die cost. Despite previous arguments pro and con, Dodge finds that die cost for press forgings is quite comparable to hammer die cost. As a matter of fact, it has been found feasible to use die steels that would not stand up under hammer pounding which have many times the life of hammer dies.

Finally it may be noted that the Dodge forge operation is really a major facility. At the present time it is capable of producing some 10,000 to 15,000 tons of forgings per month. It is of interest that the single new press forging line is able to handle 12 tons of metal an hour.

This air cleaner protects diesel engines in tractor, truck and heavy industrial power units.

AIR CLEANER PROTECTION IS NOT A MATTER OF SIZE

Plastic oil bath air cleaner for small engines such as used on power mowers.



Whether it's a small power mower engine or a giant crawler tractor power plant — both need the dust-trapping protection

of a United Oil Bath Air Cleaner. United's line of efficient cleaners protects millions of internal combustion engines in every type of operation — passenger cars, busses, tractors, trucks, farm machines, stationary and portable power units.

Widely recognized for its leadership in the field of air cleaner design and production, United Specialties Company has built and sold over 15 million air cleaners in a wide variety of types and sizes. We invite your inquiry.

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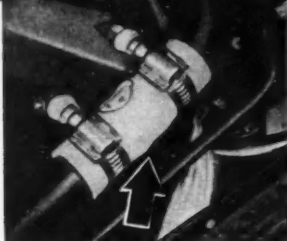
Willys to Sponsor College Scholarships

Five children of employees of the Willys-Overland Motors, Inc., will enter the University of Toledo this month under four-year scholarships provided by the company, the University and Willys-Overland announced recently.

The scholarships, offered by Willys for the first time this year, were described as "a significant development both in support of the University by industry and in industrial employee relations."

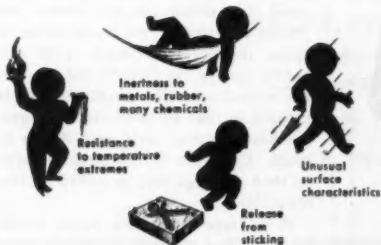
Candidates for the award were given an extensive test at the university and those recommended for consideration were referred to an awards board for final selection.

G-E SILICONE RUBBER PAYS OFF



G-E silicone ducting connects tubing carrying hot air to cabins and de-icing systems in the F-86 Sabre Jet. Its temperature resistance (-85 to 500 F) provides a high safety factor. Connection shown made by Aeroduct, Inc., for North American Aviation, Inc., from G-E silicone rubber SS-15.

THE FOUR BASIC PROPERTIES OF G-E SILICONES



IN JET PLANE APPLICATIONS

The amazing ability of General Electric silicone rubber to withstand extremes of temperature pays off by making possible long-lasting jet plane parts with a safety factor far greater than any ordinary rubber can provide.

Capable of withstanding 450 F for long periods, G-E silicone rubber is ideal for fire-wall seals and ignition cable shields in jet engines, as well as for hot-air ducting. And because it stays flexible at -85 F, it provides a reliable sealing material for the doors and windows of high-altitude aircraft.

Typical industrial applications for G-E silicone rubber include spark plug boots and ignition sleeves that stand up indefinitely under high engine heat and deteriorating oils. Seals, gaskets, washers and bushings made of G-E silicone rubber offer unusual temperature resistance, chemical inertness and excellent insulating and dielectric properties.

Where can you use G-E silicone rubber?

Have you investigated G-E silicone rubber lately? It's *three times* as strong and costs *much less* than earlier varieties. Send coupon today for a new booklet telling how you may take advantage of its unusual properties in your business.



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Waterford, New York

Please send me, free, your new booklet,
"Imagining with G-E Silicone Rubber."

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(In Canada, mail to Canadian General Electric Company, Ltd., Toronto)

G-E SILICONES FIT IN YOUR FUTURE

GENERAL  ELECTRIC

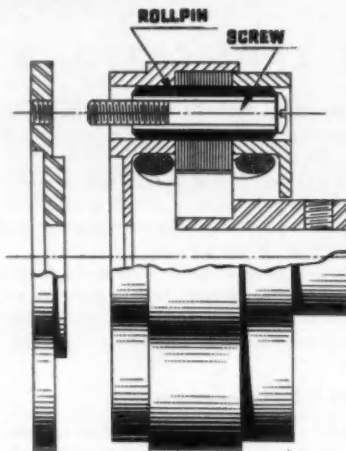
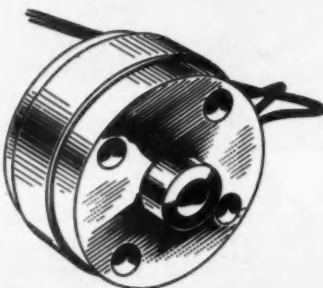
AUTOMOTIVE INDUSTRIES, October 1, 1952

Fastener Problem of the Month

Miniature synchronous brake

October 1952

PROBLEM: Allard Instrument Corporation faced three different fastening problems in the design of their miniature size synchronous brake (patents pending). Stator laminations had to be held together and in perfect alignment. Two aluminum covers had to be locked in place. Then, an adaptor plate had to be attached to the brake unit and to the host motor. Dis-assembly had to be simple and quick. Vibration was a factor. Allard designers looked for a fastening method that would be efficient and economical. No ordinary fastening devices appeared adequate.



SOLUTION: Rollpin, the hollow, split, cylindrically formed pin with chamfered ends, does all three jobs. Simply driven into holes drilled to standard sizes, Rollpin compresses as inserted. Because of the constant pressure it exerts against the hole walls, Rollpin is self-locking and vibration-proof; hole reaming or peening operations are not required. Four of these ESNA fasteners are used to fasten stator laminations, and to hold the covers in place; because of their ability to conform to minor hole-size variations, each piece is firmly gripped. A screw is then run through each pin, through the adaptor plate and into the host motor. Allard reports they could find no other fastener to perform all three functions. Dis-assembly is simple—Rollpin is quickly removed with a drift or pin punch, and can be reused.

ESNA can probably provide a practical, economical answer for your most difficult fastening problem. Mail coupon for design information.

Dept. R13-105, Elastic Stop Nut Corporation
of America
2330 Vauxhall Road, Union, New Jersey

Please send me the following free information:

... Rollpin Bulletin

... Elastic Stop Nut Bulletin

... Here is a drawing of our product. What fastener would you suggest?

Name

Title

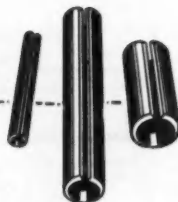
Firm

Street

City

Zone

State



Aircraft Exhaust Systems

(Continued from page 55)

course, maximum efficiency is attained under optimum parts volume. Every machine is spotted in sequence at the exact location where the work is performed. Both the numbers of employees and machines can be balanced to fit the time required for each type of fabrication and the volume of parts to be processed.

Corrections of defective workmanship are handled with dispatch. Because the assembly is set up in a sequence pattern, each employee's contribution is readily apparent to the next person in the chain. In case of an error, it is merely necessary to return the part to the preceding station, instead of perhaps laying it aside until it can retrace its path to a distant and obscure machine.

The -59 exhaust parts are the largest single-piece components used in aircraft exhaust systems and the first in which both header and collector sections are formed as integral units. A Pratt and Whitney Aircraft design, they require a variety of precise machine operations. To obtain efficient machine groupings, Ryan decided to establish the facilities in four centralized areas, served by tracked conveyor systems.

After the tubular exhaust sections have been formed and seam welded, they are loaded into racks adjoining the first area. Here, they are fitted with hangers and brackets. Roving crews feed the parts from seven jigs which fan into a central welding circle.

In area two, the parts flow through a series of machines which trim, face, burr, sandblast and size them. The conveyor lines circle within the machines to provide best access.

Area three is a pattern of seven steel jigs which are on wheels and tracks converging into a central turntable, or merry-go-round. Port and outlet flanges are located and the jigs are rolled onto the turntable. It is rotated so that an overhead, twin-gun machine can spot weld each flange in place. Conveyor tracks circle outside so that the jigs can be rolled to the turntable.

From area three, the parts go to seam-welding machines where the flanges are permanently welded on. Thence, they are taken to area four where they receive another series of machine operations which involve a submerged pressure test, installation

"DETROIT" Universal Joints . . .



. . . 40 Years of Leadership in Quality

"DETROIT" Universal Joints, backed by 40 years of specialized experience and 50,000,000 installations, are the leader in their field. Successful products—those incorporating basic improvements and manufactured to rigid standards of quality—must expect imitation. "DETROIT" Universal Joints have been imitated, but never duplicated.

DETROIT
UNIVERSAL JOINTS



UNIVERSAL PRODUCTS COMPANY, Inc., Dearborn, Michigan

of hanger bushings and reaming of bushings and brackets. Special finned joint seats are attached to support a capsule-type joint which isolates the exhaust system from engine vibration

and provides thermal expansion accommodation. After final alignment and inspection, the completed parts are placed in mobile racks and sent to the shipping department.

Special Landing Gear Test Equipment

(Continued from page 61)

Heavy loads have to be carried on the bearings between the swinging arms, those at the rear of the lower swinging arm being as high as 200

tons and those at the rear of the upper swinging arm up to 100 tons. Lower pins are therefore eight in. in diameter and the upper ones six in.,

running in phosphor bronze bushings.

The moving post is four ft in width to accommodate the large brackets necessary for attaching the aircraft landing gear, the load being distributed over about 50 one-in. bolts. The bare post weighs 12½ tons, the lower swinging arm eight tons, the upper swinging arm six tons, and the two main members of the rear frame each weigh 10 tons. Such masses necessitate special foundations, and are set in concrete six ft thick.

The hydraulic power for both main lifting jacks is provided by a special Live Line pump with a working pressure of 3000 psi, and driven by a 7½ hp electric motor at 3000 rpm. As a safety measure, to assure the post being held in any position during rigging and adjustment, a hydraulic lock is inserted at the base of each cylinder. A mechanical safety catch makes it impossible for the quick release to be inadvertently tripped.

Drag conditions on the aircraft when the wheels are all on one axle are simulated by dropping on reinforced concrete wedges. Two sets of wedges have been made, one pair at 22 deg and the other at 38½ deg; these represent a co-efficient of friction of 0.4 and 0.8 respectively. Wheel spinning is provided for by a 25 hp electric motor.

Recording equipment provides for total movement of the falling mass, shock absorber movement, tire deflection, and acceleration. For the first three investigations mechanical linkages are arranged with rubber bobbins on sliders so as to indicate the maximum positions of the travel. For mechanical recording of acceleration an R.A.E. type C accelerometer is attached to a rigid part of the landing gear. The free fall of the mass is arranged so that the velocity at the instant of impact is that stipulated. In the case of the Brabazon I the maximum velocity is 11.5 fps. As the critical portion of the operation takes less than one quarter second, multi-channel electronic equipment is used.

To ascertain dynamic stresses during drop testing, electrical resistance strain gages are used. If necessary, the changes in strain of a number of gages can be recorded on one cathode-ray tube by inserting a high speed switch, so that the record of each gage consists of a number of closely spaced dots. The Dowty rig provides for the reproduction of all the conditions of dropping for single and twin wheel types and for such variants as one tire being 10 per cent overinflated and the other 10 per cent under, or one tire assumed flat.

BALLS FOR BEARINGS AND OTHER BALL APPLICATIONS



Precision balls made for your job — available in a variety of materials. Your specifications will receive prompt attention in our Engineering Department. We are thoroughly experienced in supplying the automotive industry with special bearings, retainers and balls. Let us give you our recommendations.

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GUARANTEE TRUST BLDG.
972 BRAD ST.

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Operations on
Tractor Front
Wheel Knuckle
Housing

Mult-Au-Matic work is not confined to any one field of industry but extends over a wide range of products made from varying types of materials. Today, under the defense program, these machines are in extensive use because of their high productive capacity, their consistent repetitive accuracy and their reliability with minimum "Down-Time".

Whether it is defense work or normal peace-time production the Mult-Au-Matics provide a low unit cost manufacturing method.

There is a Mult-Au-Matic for nearly any size job up to 34 inches in diameter.

*For Manufacturing Economy use
Mult-Au-Matics. Built in
8-, 12-, 16-, and 34-inch sizes
with 4, 6, 8, 12, or 16 spindles
according to the specific model.*

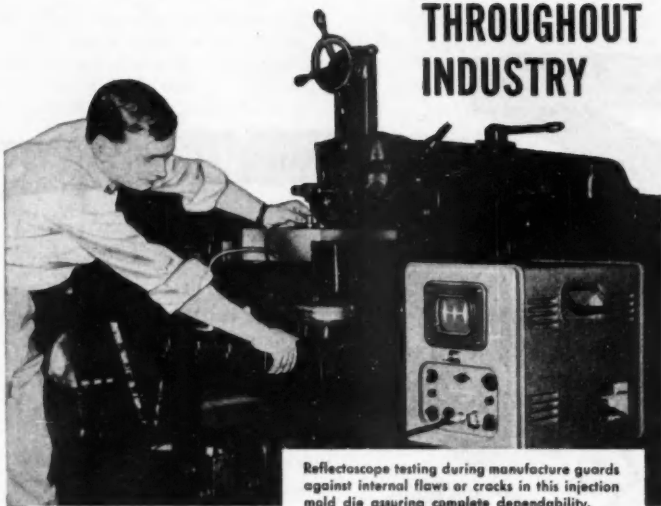
The Mult-Au-Matic method has a basic time element for Manufacturing Economy. The time to produce a finished piece of work is equal to the time for the longest operation plus a few seconds for indexing. Mult-Au-Matics are considered as Key Units for repetitive machining of work where Accuracy and Fast Economical Production are the requirements.



THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

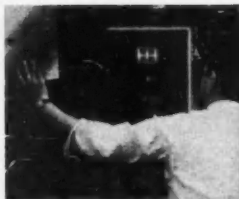
THROUGHOUT INDUSTRY



Reflectoscope testing during manufacture guards against internal flaws or cracks in this injection mold die assuring complete dependability.



Reflectoscope testing prior to machining eliminates wasted time and loss of materials resulting from faulty metal.



Testing this large finished die assures freedom from internal defect and possible failure-in-use.

Assure
CUSTOMER SATISFACTION

Eliminate
WASTE • REJECTS

WITH



**ULTRASONIC
TESTING**

The Chicago Impression Die Company — makers of plastic injection mold dies — is one of the many firms throughout industry that has found two important benefits from Sperry Ultrasonic Reflectoscope testing.

First — Testing of raw materials before processing eliminates the many man- and machine-hours that are wasted when hidden flaws or inclusions are discovered during manufacture. Second — Reflectoscope testing the finished products assures that no flaws have developed that might cause failure in use. Customer acceptance and satisfaction is assured.

Simple, economical and effective in operation, the Reflectoscope penetrates up to 30 feet in solid metal with an ultrasonic beam that dependably detects and locates hidden internal flaws, defects and inclusions.

Write today for complete information; learn how you can reduce testing costs and improve quality control in your plant. The Sperry Reflectoscope is available through Sperry's convenient, economical, in-plant Testing Service, conducted by Sperry's experienced Inspection Engineers. Ask for details concerning sale or rental of the Sperry Ultrasonic Reflectoscope.



SPERRY PRODUCTS, INC.
210 SHELTER ROCK ROAD
Danbury, Connecticut

REPRESENTATIVES IN PRINCIPAL CITIES

Simple Calorimeter

(Continued from page 65)

the electrodes, conduction through the tube wall, and radiation from the heat source. The accuracy of this system of measurement is not affected by such losses if all conditions, including the losses, of the known heat run duplicate corresponding conditions of the unknown arc test. Even if conditions cannot be duplicated exactly, errors may be minimized by reducing to the lowest point all losses in both cases; i.e., by making the design such that practically all the arc energy and calibrating energy are converted to temperature rise in the air streams.

Conduction losses may be minimized by insulating the tube and the electrodes. Enclosure of the apparatus in a box suitable for eliminating drafts is desirable. Radiation losses may be minimized by use of radiation shields arranged so as to prevent direct radiation from the heat source to or beyond the grid. A pair of simple plates such as shown in Fig. 1 can be quite effective as a radiation shield when the average arc power is low. When power is high enough to raise the shield temperature to the point where re-radiation might be appreciable, or when higher accuracy is required, a multiple shield completely surrounding the arc may be used to good advantage.

A method of determining temperature of the grids without a special circuit is to use a standard resistance bridge, checking top and bottom grid resistance repeatedly until equilibrium is reached. A more convenient and less time-consuming circuit arrangement is shown in Fig. 2.

With this arrangement a null reading of the galvanometer may be obtained by adjustment of the sliding contact on potentiometer R4. If other factors are under control so that R1 and R2 are affected only by power input to the calorimeter, the dial of R4 may be calibrated in watts. Measurement of the power in an arc then consists simply of adjusting R4 for a null reading of the galvanometer after equilibrium is reached, and reading the scale of R4. Calibration against a known power input should be made frequently enough to assure minimum error from changes in ambient temperature or other factors affecting heat transfer.

Sensitivity may be controlled through use of R6 to adjust voltage applied to the measuring circuit. Care should be taken not to apply enough



Superior Magneto Corporation, of Long Island City, New York, molds its own magneto parts from Plaskon Alkyd. Superior electrical properties, plus speed and ease of molding, with few rejects, make the Superior Magneto (shown here) a better product.

Greater arc resistance in molded electrical parts

For high arc resistance and dielectric strength in automotive electrical parts, use Plaskon Alkyd

NOW YOU CAN design more compact electrical parts that resist high-voltage tracking and carbon arcing, with moldings of Plaskon Alkyd.

Plaskon Alkyd's arc resistance of 180 sec., A.S.T.M., provides an extra margin of safety; permits closer clearances and terminal spacings, smaller over-all dimensions in electrical parts.

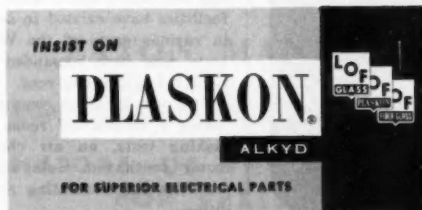
Moldings of Plaskon Alkyd have excellent dimensional stability, too; withstand constant temperatures up to 300° F. without warping. Precision parts, with minimum after-shrinkage, can be molded to extremely close tolerances.

For molders, Plaskon Alkyd means high-speed molding to meet the most exacting automotive production schedules. Plaskon Alkyd cures remarkably fast, and the increased productivity per mold cavity means fewer molds, lower tooling costs.

If you are interested in automotive parts such as magnetos, ignition coils, distributors, dimmer switches or rotors, see how they can be improved with Plaskon Alkyd. Write to Dept. A-102, Plaskon Division, Libbey-Owens-Ford Glass Company, Toledo 6, Ohio, for complete information today.



Products molded of fast-curing Plaskon Alkyd have high dielectric strength and arc resistance; show superior resistance to high-voltage arcing and tracking.



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Libbey-Owens-Ford
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Manufacturers of Molding Compounds,
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voltage to produce appreciable self heating in the grids themselves.

It is frequently necessary to measure total energy per discharge in a series of spark discharges. This may be accomplished by measuring the average power and dividing by repetition rate.

Should the arc condition under study be one that takes place in an air stream, air of the correct velocity should be introduced into the tube C during test and calibration.

A calorimeter of the type described is in daily use at the General Electric

Company's Specialty Transformer and Ballast Dept. It has been found accurate over the range of arc energies associated with jet engine ignition. Elements of a similar unit have been

delivered to Lewis Flight Propulsion Laboratory of National Advisory Committee for Aeronautics for their use in evaluating capacitor discharge ignition systems.

Multiple Nut Runners at Ford

(Continued from page 57)

For the other operations, there are two identical lines. Removal of bearing caps with single power tools per-

mitted production of 120 units per man-hour. The job now is done with a four-spindle tool which combines four Size 58Y Impacttools and production is 250 units per man-hour.

Reinstallation of the bearing caps was handled with single tools at the rate of 120 per man-hour. Now, four Size OBN air motors are combined in a four-spindle unit which permits a production rate of 250 units per man-hour. The four cap screws are run down to just five lb-ft. After final hand adjustment, it requires only half a turn with a torque wrench to get the desired 80 lb torque.

Including greater tool output and partial elimination of torque testing, the introduction of multiple nut runners is said to have cut units production time for the four nut-running operations more than 70 per cent. An additional advantage is that the combination of four or five power tools effectively balances out any torque which the single tool might transmit to the operator.

Finally, there has been an improvement in quality control. With identical air motors powered by compressed air from a common backhead and run until stalled by resistance, full uniformity is achieved.

Locomotive Motor Test Facility Announced

A new test facility for motor engineering development has been announced by the Locomotive and Car Equipment Dept. of General Electric Co. in Erie, Pa. This installation, covering 20,000 sq ft, is equipped to test traction motors and generators for locomotives beyond the size of any now being built. Although these facilities have existed to some degree in various parts of the Works, they have now been expanded and consolidated under one roof.

The new facilities comprise 11 test tables, a soundproof room for noise-making tests, an air chamber for motor ventilation tests and lift-test facilities for simulating service conditions.

HARDENED & GROUND PARTS to exact specification

This spring pivot bolt typifies our machining versatility and strict adherence to specifications. Bolt is made from 1 1/4" high-carbon alloy steel hex bar stock; overall length, 5 1/2". Threads are precision cut, concentric with body diameter. After heat treating, threads are re-threaded to the specified pitch diameter. Bearing surface is ground to a fine micro-finish, ± .001 tolerance. The very latest equipment is used to make the knurling clean and sharp.

Brown Hardened and Ground Parts have served the automotive industry for over 40 years. Our specialty is precision machining, scientifically - controlled heat treating and micro-finish grinding. How can we serve you? Write or wire . . .

Henry W. Brown
PRESIDENT

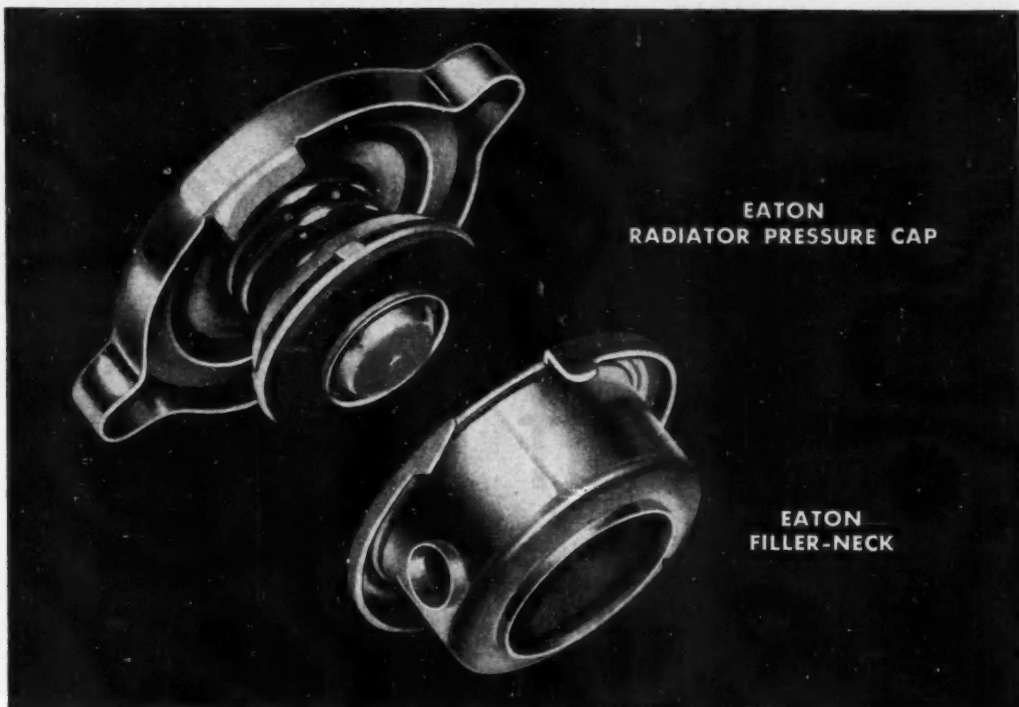
Experienced production on:
King Pins
Shackle Bolts
Shackle Pins
Brake Anchor Bolts
Countershafts
Idler Shafts
Stub Axle Shafts
Steering Ball Bolts
Beam Balls and Bolts
5th Wheel Rocker Shafts
Wheel Studs
Water Pump Shafts
anything in the hardened and ground line, of any analysis steel, up to 4"

THE BROWN CORP.

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EATON
RADIATOR PRESSURE CAP

EATON
FILLER-NECK

This Pair Makes Engines Run Better

By sealing the cooling system and raising the boiling point of the coolant, the Eaton pressure relief cap permits engines to operate in a more efficient and more economical temperature range without boiling away water or anti-freeze; provides for smoother engine performance, better lubrication, quicker warm-up, improved heater operation. In heavy-duty service, at high altitudes, or in extremely warm climates, this is an important safeguard against possible engine damage due to loss of coolant through evaporation. It also prevents loss of coolant due to surge.

With a sealed cooling system vehicles can be designed with smaller radiators at considerable saving in cost.

Eaton offers the advantage of a single source of supply for pressure cap and filler-neck requirements; eliminates divided responsibility; assures positive mating of cap and neck; saves engineering and purchasing contact time. Eaton engineers will welcome an opportunity to work with you in developing the most efficient and economical closure—standard or pressure type—for your cooling systems.

EATON MANUFACTURING COMPANY

CLEVELAND, OHIO

STAMPING DIVISION: Detroit Office, 18001 James Couzens Highway, Detroit 35, Michigan

**ORIGINATORS OF THE BAYONET-TYPE CAP AND FILLER-NECK
FOR PRESSURIZED COOLING SYSTEMS**

Brand New

and

A STANDOUT FOR SPEED, CAPACITY AND TOP QUALITY LAPPING

**Norton's Single Face Lapping Machine with
Bonded Abrasive Laps Saves On Jobs Up to
60% . . . A Sensational Performer Particularly
On Soft Metals**

Here's the greatest advancement ever made over old methods of lapping with loose abrasives. Norton's new single face, flat lapping machine combines a bonded abrasive lap with many other efficiency-boosting features to assure amazingly better, lower cost results.

You'll find these factors, plus ample capacity, make it the outstanding machine for lapping large castings of gray iron, aluminum, brass, magnesium and other soft metals. And on metals of every degree of hardness its faster, smoother performance will save you time and money throughout a long, trouble-free service life.

TYPICAL ADVANCED FEATURES

Hydraulic Pressure Device. Makes up for any lack of weight in work by applying correct compensating pressure for best lapping control.

Power Operated Truing Arm. Fully adjustable, providing slow to rapid traverse across lap. Simplifies maintenance of desired finish throughout the life of the lap.

Loadless Starting, Inertia Delay Clutch. Assures smooth pickup and even torque.

Automatic Operation. Requires only loading of machine and push-button starting to complete the electrically timed work cycle.

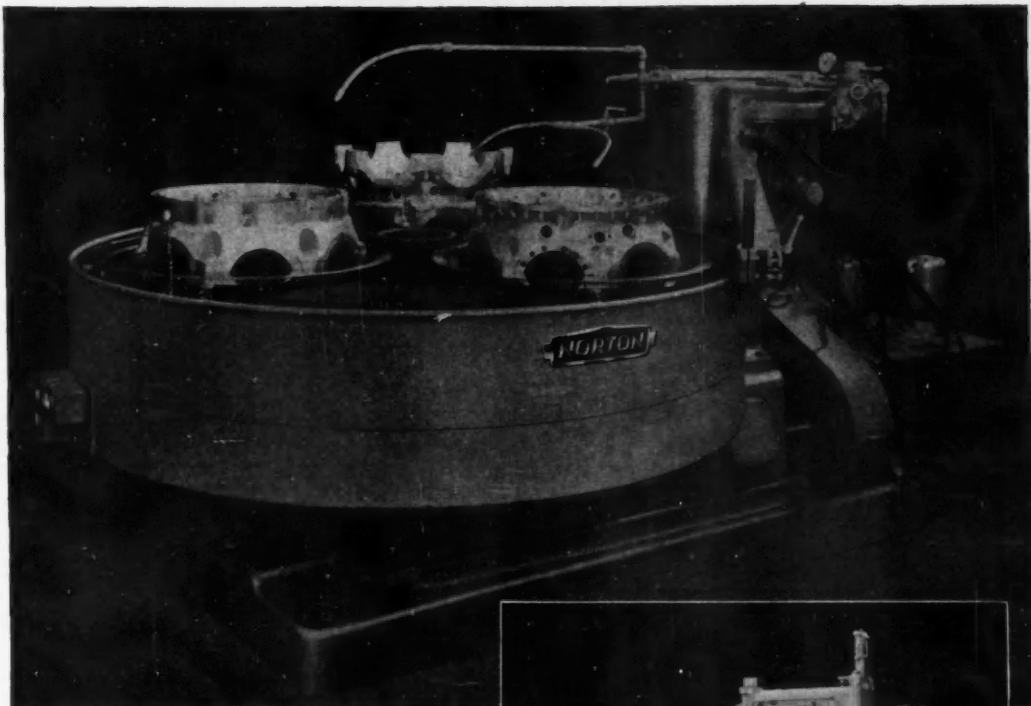
Large Capacity Range. Includes lap sizes of 48", and 60". Maximum size enables handling of three 24" pieces or one 60" piece (largest dimension).

POSITIVE ADVANTAGES

Cleaner Work. Coated only by a thin, filtered oil, the surfaces finished by bonded abrasive lapping are free from the sludge left by loose abrasives.

Brighter Surfaces. Bonded abrasive lapping produces brighter surfaces on any metal, with no later polishing required.

Safer. By keeping the pores and crevices of the metal free from imbedded grit, the bonded abrasive enables



BONDED ABRASIVE LAPPING of aircraft engine housings reaches peak efficiency in the New Norton 60" Single Face Flat Lapping Machine. For faster stock removal, work is driven in opposite direction to its normal tendency to rotate.

safe lapping of soft metals to provide seal surfaces, wear surfaces, or surfaces for drilling or milling. This also eliminates the need of thorough cleaning after lapping, to rid surfaces of imbedded abrasive.

Faster. Cutting speed, on many materials, is 2 to 5 times faster than loose abrasive lapping for the same amount of stock removal.

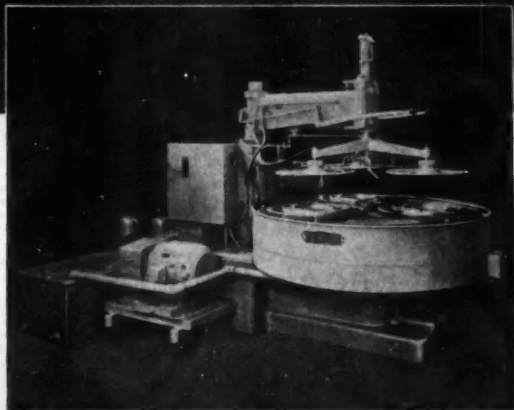
More Accurate Products. The simple, positive lap-truing device results in maximum product-accuracy on every job.

Greater Economy. Bonded abrasive laps are long-lasting and easy to replace. A low priced coolant is used. Inspection tools are subjected to less wear than on parts lapped with loose abrasives. Labor expenses for extra cleaning and polishing operations are eliminated. And with Norton laps made to match Norton machines exactly, you get an unbeatable cost-cutting combination.

FOR COMPLETE DETAILS

see your Norton Representative or write us direct.
NORTON COMPANY, Machine Division,
Worcester 6, Mass.

AUTOMOTIVE INDUSTRIES, October 1, 1952



HYDRAULIC PRESSURE DEVICE, shown in position, is used to apply additional lapping pressure for light work pieces.

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GRINDERS and LAPPERS

Making better products to make other products better

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Here's
How

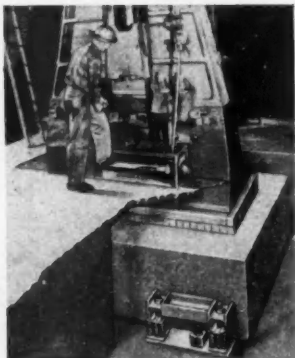
Thompson Products, Inc.
INCREASED PRODUCTION
WITH STRAIGHT-LINE
WORK FLOW.

...by Controlling Hammer Shock

Thompson Products, Inc., manufacturers of automotive, aircraft, and electronic precision parts, found that hammer vibration made accurate work on nearby grinders impossible. In fact, a new building was planned to segregate the hammers from the grinders, sacrificing the benefits of straight-line production.

However, Korfund spring-isolated hammer foundations completely solved the problem—permitted use of the hammers and grinders side by side for maximum production. And no new building was needed.

Materials handling costs were cut, construction costs reduced, hammer and worker efficiency increased, and maintenance costs on hammers, grinders, and buildings were reduced.

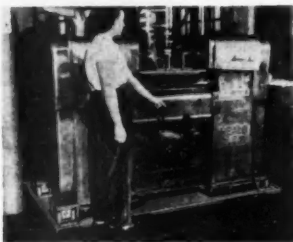


Typical spring-isolated foundation for a 2500g steam hammer. Tests prove there is actually a slight increase in hammer blow efficiency. Shock isolation is so complete that a coin will remain standing on edge beside the foundation as maximum blows are struck!

...by Shock Mounting Machine Tools

For maximum work-flow on piston machining lines, Thompson installed two automatic boring machines 10 feet apart. With both machines operating, shock transmitted from one to the other caused intermittent skips and gouges.

One machine had to be kept idle until they were both mounted on Korfund steel spring Vibro-Isolators. Now they operate together and turn out perfect work. Yet the cost of Korfund complete isolation was little more than with less effective methods.



Today's automatic machine tools, built to perform several operations in sequence, pay off in high production to close tolerances when protected from external disturbances.

You will find Korfund data sheets in Sweet's Mechanical Industries, Process Industries, Engineering, or Architectural Files. We'll also gladly supply complete information and recommendations, without obligation. Just contact us, or the Korfund representative you'll find in most principal cities. A half century of experience is at your disposal.

THE KORFUND COMPANY, INC.

48-02 A Thirty Second Place, Long Island City 1, N. Y.
In Canada: 510 Canal Bank, Ville St. Pierre, Montreal

Jet Age Problems

(Continued from page 49)

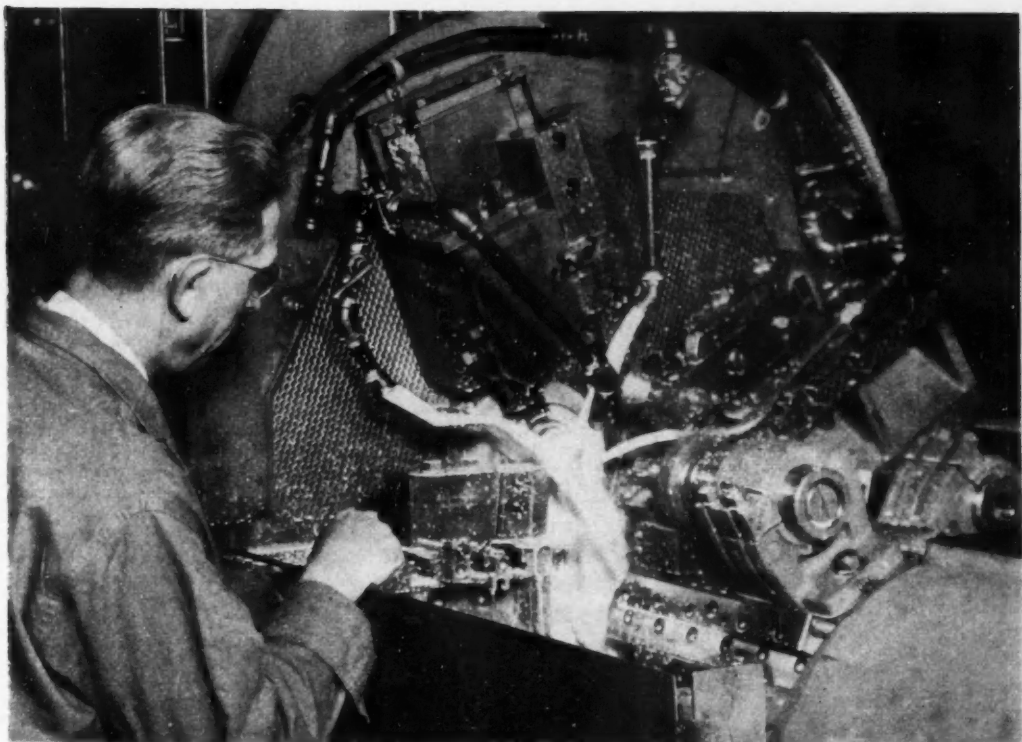
Costly Electronics

Supporting Mr. Ferguson's statements about the increasing complexity of aircraft, General Ira C. Eaker, vice president of Hughes Aircraft Corp., cited the fantastic growth of the electronics industry. In 1940 it totalled about \$500 million, but this year it will reach about \$5 billion and in an all-out war would increase to about \$20 billion a year. He said that electronic equipment in the fighter plane today costs more than the entire plane in World War II, and in some late model planes represents 60 per cent of the total cost. He predicted that before too long cost of electronics may represent 75 per cent of the total cost of modern weapons.

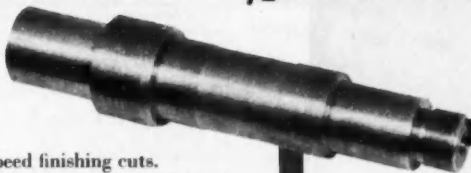
General Baker said that there is a serious shortage of laboratory facilities, and of scientists and technicians, for development work on new complex electronics devices necessary for modern warfare. He predicted that the current phase of electronic control will be superseded between 1955 and 1960 by electronics taking over most of the functions of manned interceptors, with complete instrument control during take-off, in navigation, in fire control, and in landing.

He said this would be followed by another phase which will be featured by ground-to-air missiles requiring no pilot, and which will replace the interceptor entirely. The next phase after that, he said, will be characterized by surface-to-surface guided missiles with uncanny accuracy, supersonic speeds, and out-of-the-atmosphere trajectories which will offer serious problems of interception.

A big problem for airframe manufacturers, according to Mundy I. Peale, president of Republic Aviation Corp., is that they do not control specifications and design of components. He said the plane companies must coordinate design and construction of a multiplicity of parts, reconciling Air Force specifications with individual components of manufacturers and with their own design and engineering requirements. He said that suggestions that the plane builders go into the electronics and components business or be directly responsible for ordering parts and components was not practical, since different manufacturers would specify



MODEL M...more than 6½ times faster on this shaft!



You can spot one of the important reasons for this production increase right in the design of the Acme-Gridley Model M Single Spindle Automatic. There are three automatic spindle-speed ranges to give the correct surface speed for any kind of cut, any diameter. On this job, for example, the operation sequence goes from carbide cuts, to high-speed steel for forming cuts, to die-head threading—and back to

high-speed finishing cuts. There are other time-saving features, too—independent camming for the eight tool slides, to permit combining cuts; wide, open tooling zones, for easy access; heavy, rigid frame construction, to permit the use of carbide tools; simple camming, for quick change-overs. These and many others are explained in Bulletin M-50. Be sure to ask us for your copy.

JOB FACTS

PART..... Steel Sprocket Shaft,
3¾" long

OPERATIONS.....10

MACHINE TIME...1 Min., 50 Sec.

FORMER MACHINE TIME...12 Min.
(Engine Lathe)

MACHINE... 3½" Acme-Gridley
Model M Single Spindle Automatic.

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics:
1-4-6 and 8 Spindle • Hydraulic Thread
Rolling Machines • Automatic Threading Dies
and Taps • The Chronolog • Limit, Motor Starter
and Control Station Switches • Solenoids
Centrifuges • Contract Manufacturing

completely different designs for thousands of parts, greatly increasing cost.

Engines Now Limiting Factor

He said there is great need for concentrated research in three separate fields—engine design, production methods, and metallurgy. Present limiting factor in the aircraft program is the power plant, he said, and the need for more powerful engines is most urgent. Also more intensive

scrutiny is required of production methods, particularly in forgings and extrusions. He said that the overwhelming trend is toward use of forgings instead of built-up parts and that the large forging press program of the Air Force must be maintained on schedule.

Metallurgy will become increasingly important as aircraft regularly attain speeds of about 2000 mph, Mr. Peale said. He pointed out that a plane flying at that speed at 60,000 ft would generate a skin temperature as high as 603 F, even at air tempera-

tures of -65 F. Consequently, new heat-resistant metals must be developed since aluminum loses nearly all of its strength at that temperature. He added that as much as possible of research activities should be done by private enterprise but that such a program is difficult for the aircraft industry because of the "feast and famine" treatment of airpower in the postwar period.

Dual-Purpose Plants Needed

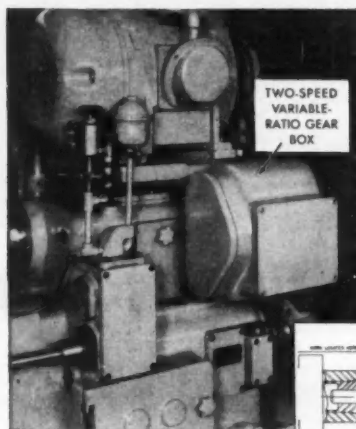
John F. Gordon, General Motors Corp. vice-president, represented the automobile industry at the symposium and pointed out that automobile companies had long played leading roles in aviation development. He said that about 60,000 employees are working on defense production in automobile industry plants, much of it for the Air Force. He strongly advocated the dual purpose plant such as General Motors is building in Texas for simultaneous production of defense goods and civilian items, or sole output of either category in line with national needs. He predicted that this country will be living under a "mixed economy" for an indefinite period ahead and that the dual purpose plant would minimize disruptions in the work force and make for a stable economy.

Other speakers at the symposium included John F. Floberg, assistant secretary of the Navy for Air; Karl Bendetsen, undersecretary of the Army; R. L. Gilpatrick, undersecretary of the Air Force; Lt. Gen. Leon Johnson, Commanding General of USAF-COAAC; and Walter P. Reuther, president of the UAW-CIO.

General trend of the talks by the military representatives was that the stretch-out in the defense program has pushed completion of the 143-wing authorized strength of the Air Force back to mid-1955 and that a prolonged period of tension lies ahead. Their talks also reveal that there is considerably increased interest in the helicopter as a tactical military weapon, because of its versatility not only as a supply and rescue vehicle, but also for actual combat operations in moving troops and supplying them in otherwise inaccessible areas.

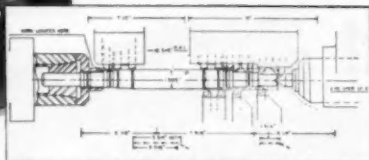
MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE So-swing PEOPLE" SENECA FALLS, NEW YORK



Combined Turning and Squaring Operations at Different Cutting Speeds Now Possible with So-swing Automatically Controlled Two-Speed Headstock

Left: View of two-speed, Variable-Ratio Gear Box with Belt Guards removed.
Below: Tooling layout for electric motor shaft.



Problem: To turn, face and undercut shoulders on electric motor shafts, using cemented carbide tools for the turning operations and high speed steel tools for facing, grooving and chamfering operations which require a very smooth finish. Both operations to be made in one handling with automatic spindle speed change between the turning and squaring operations.

Solution: A Model "LR" Automatic So-swing Lathe was equipped with a Two-Speed, Variable-Ratio, Gear Box. The speed change from high to low and back to high again in a single machine cycle is controlled by two adjustable cams, mounted on the main cam shaft, which may be set to operate the multiple disc clutch at any time during the machine cycle. The ratio between the high and low speeds may be readily modified through pick-off gears to suit special conditions.

The tooling layout shows the second of two operations on a 1½" diameter electric motor

shaft. The shaft is held and driven, on a previously turned diameter, in an air-operated collet chuck which grips the shaft well in from the end, exposing only the part to be machined. This method reduces the shaft's effective length and eliminates springing. The work is positively located from a previously finished shoulder, insuring accuracy of shoulder lengths.

The shaft diameters are turned with sintered carbide tools mounted on the front carriage, cutting at a surface speed of 350 ft. per minute. The squaring and forming tools are mounted on the rear slide and operate at a surface speed of 70 ft. per minute, insuring a very high polished surface on the shoulders and formed grooves. This combination assures high production, coupled with smoothly finished shoulders, both of which are very desirable on electric motor shafts.

Consult Seneca Falls engineers regarding your automatic turning problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH So-swing

**YOUR JOB IS CLEAR
—GET IN THE SCRAP
to keep steel coming**

NON-FERROUS SCRAP is needed too!

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*Cartridge Seal... pressure balanced... requiring only 25% more space than lip-type seals.

If you have a shaft sealing problem, Gits experience in these and many other specific applications can prove of great and immediate value to you.

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Gits Lubricating Devices,
The Standard For Industry For Over 40 Years



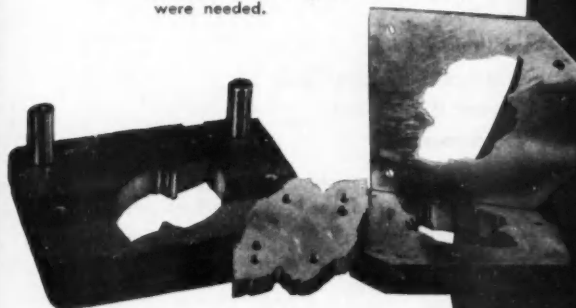
MACHINE ALL SORTS OF

PRATT & WHITNEY

Rotary feed tool
for a P & W Vertical
the three cylindrical
by arrows. Thus, no
were required.



Surfaces in fourteen different planes
on this box jig were finished rapidly
and economically with a P & W Vertical
Shaper. No changes in this set-up
were needed.

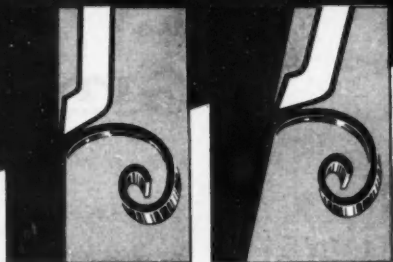


Producing this die set—including die, die shoe,
stripper—required the machining of intricate and
many sharp corners. A Pratt & Whitney Vertical
did the job easily and with substantial time saving.



This nickel steel, twelve tooth,
flexible clutch for a reduction
gear mechanism has an
outside diameter of $34\frac{1}{8}$ ".
The teeth were machined to
.001" accuracy on a P & W
Vertical Shaper.

"The Handiest Machine in Your Shop"



IRREGULAR SHAPES

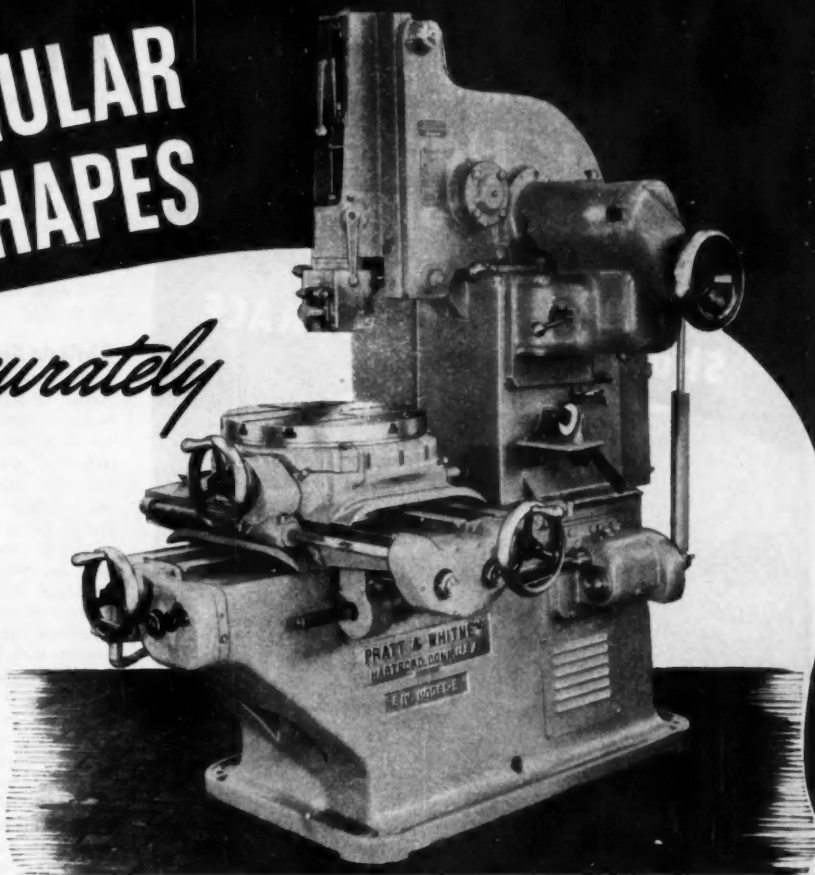
Accurately

Model B

TWO SIZES

6" RAM STROKE

12" RAM STROKE



Versatile, powerful and accurate, Pratt & Whitney Vertical Shapers efficiently handle a wide variety of irregular shapes that cannot be machined conveniently or economically by any other method. P & W vertical design — with all cutting pressures taken directly on the table and bed — eliminates springing and assures permanent accuracy. The cutting action tends to hold the work in place. This feature — plus the built-in rotary table with power feed — makes mounting and indexing easy. Intricate forms can readily be machined without

costly set-up changes, and expensive jigs and fixtures are practically eliminated.

Pratt & Whitney Model B Vertical Shapers are made in two sizes; 6" ram stroke and 12" ram stroke. A wide range of work sizes can be accommodated. In the die shop, tool room, for general repair work — and everywhere that irregular shapes are handled — P & W Vertical Shapers will do your difficult jobs faster and at lower costs.

Write on your Company letterhead for Circular No. 423-B



PRATT & WHITNEY

DIVISION NILES-BEMENT-POND COMPANY

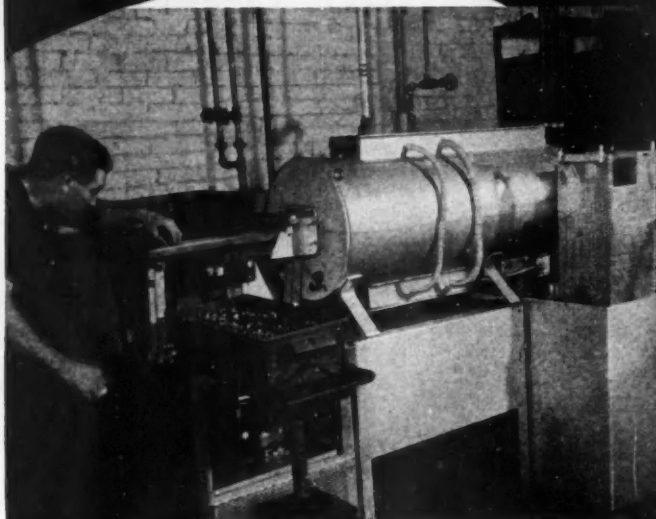
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"We bright harden carbon, vanadium, and stainless steel springs without distortion in our Hevi Duty Shaker Hearth furnace," says the Raymond Mfg. Co. of Corry, Pennsylvania.

"Our Hevi Duty Shaker Hearth furnace handles orders faster, and work comes out of the furnace clean and bright with no scale or decarburization."

Hevi Duty standard Shaker Hearth Furnaces will carburize, nitride, dry cyanide or bright harden up to 150 lbs. of small parts per hour. Operation of this production machine is semi-automatic.

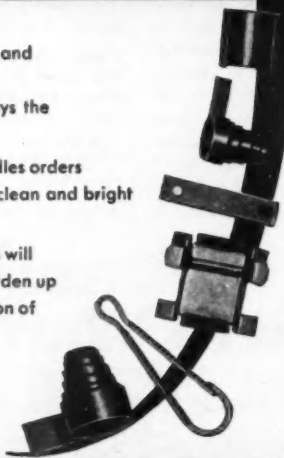
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HEVI DUTY ELECTRIC COMPANY

MILWAUKEE 1, WISCONSIN

Heat Treating Furnaces... Electric Exclusively
 Dry Type Transformers Constant Current Regulators



METALS

(Continued from page 70)

Michigan copper mine, was granted a 2½ cents per lb ceiling increase for its output. This, in effect, makes three prices for copper effective officially in this country, all for the same product and the same purity, 24½ cents for most domestic metal, 27½ cents for Lake copper, 36 cents for foreign.

Chilean Situation Improved

The general copper situation was further disturbed by the election of Senor Ibanez as President of Chile, who was believed to have strong nationalistic sentiments. Any interference with normal exports of Chile's heavy copper output to the United States would have the most serious impact on domestic supply. Sentiment was improved by the reassuring statement of the President-elect that he had no desire to nationalize the mines and wanted only the friendliest relation with the United States.

Chilean copper is still in good demand at 36 cents a lb with output of the largest producer sold ahead well into November. But most trade observers believe this price cannot last and reflects overbuying by consumers anxious to rebuild inventories. The head of the powerful Katanga mine in Belgian Congo warns his stockholders that even 30 cents a lb for copper is too high and to expect lower world prices.

Copper statistics for August showed improved shipments to fabricators, but the trade wonders if the fabricators themselves shipped an equal tonnage to their customers. In July they received 115,000 tons. The vacation period caused the decline, it was claimed. The August figures will be examined with concern.

Aluminum Output

Production of primary aluminum in July was 78,368 tons, nearly 900 tons more than in June and about 6000 tons more than a year ago. But estimates of increased output in later months may have to be revised downward because of drought conditions in the Bonneville area with consequent loss of essential water power. Northwest potlines are counted on to produce more than 350,000 tons of aluminum with normal power supply.

Manufacturers still think they can get all the CMP tickets needed for the first quarter of 1953. Without much doubt aluminum will be in

MICROHONING is in your future

if your operation requires the generation of accurate cylindrical or flat surfaces.

Hundreds of industrial plants have found that Microhoning not only improves the quality of the surface, but also increases production—reduces scrap, handling, and inspection costs.

No, you do not need a crystal ball.

The potentials of the Microhoning process can best be judged by the past accomplishments and present policy of the organization that developed it.

To give industry a complete service, the Micromatic Hone Corporation has an organization and sales policy unique in the machine-tool business. One well-coordinated organization sells, engineers, builds, and services the complete installation. Micromatic assumes full responsibility for all the equipment and the results obtained with the Microhoning process.

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would you like
placed in your hands?

Plastic? Glass-filled? Fiberglass-filled? Rubber-filled?
Nylon? Bakelite? Dacron? Metallic inserts? Polished?

The carbide part shown here is typical of a
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the nation's leading automotive manufacturers.

The smaller piece, which contains a steel-tipped
brass insert made to a $\pm .002$ " concentric tolerance,
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PRP serves all industry; if you have a peculiar
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PRP

abundant supply by the middle of the year, but if the Munitions Board starts to stockpile non-defense consumers may have to shop around. Meanwhile Anaconda Copper is ready to go ahead with its \$45 million Montana project to produce aluminum and Alcoa will undertake construction of a \$400 million smelter in Alaska with proposed initial capacity of 200,000 tons annually. However, it will be 1957 before any of the aluminum will come on the market.

Steady inroads are being made by aluminum into copper's most cherished market—the electrical industry. Practically every new utility installation is now using aluminum transmission lines instead of copper. Substantial savings are reported particularly because towers can be spaced further apart as aluminum conductors save on weight. General Electric reports highly satisfactory results by substitution of aluminum for copper in bus bars. Alcoa has come up with a new aluminum alloy with a brilliant finish to replace chromium plating and stainless steel.

On the other hand an important manufacturer of automobile radiators declares after extensive trial that there's no satisfactory substitute for copper for radiator core construction.

Lead Market Satisfactory

While consumers have not been scrambling for lead at 16 cents a lb producers are not worried and believe the price will hold. It is not difficult now to see why lead was weak in the first half of the year. Imports of foreign lead in the January-July period totalled 265,000 tons, or 17,000 tons more than during the whole of 1951. Biggest month was May, with a monthly average of 20,000 tons last year. The object was to beat the deadline before the duty was restored in June on foreign lead. June imports were still high at 65,700 tons, but the rate is likely to be less from now on.

Lead producers derive satisfaction from the sharp pickup in shipments of replacement batteries in July, which totalled 2,528,000 units, a high for 1952 and nearly 1,000,000 units more than in June. Plenty of opportunity appears for further heavy shipments in the fall months which would be the normal seasonal pattern. For the first seven months of 1952 total battery shipments were 9,420,000 compared with 11,149,000 units for the same period of 1951. To attain the 1951 total of 22,218,000 units, the monthly rate must continue at 2,600,000 units for the rest of the



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DIMENSIONAL PACKAGING



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SHELBYVILLE, INDIANA

NEW YORK PHILADELPHIA BUFFALO CLEVELAND DETROIT CHICAGO LOS ANGELES SAN FRANCISCO PORTLAND SEATTLE

AUTOMOTIVE INDUSTRIES, October 1, 1952

year. This does not seem impossible with over 53 million motor vehicles registered on the road.


However, it must be pointed out that London believes the lead price is too high and will sell down. Trading in London on the Metal Exchange starts in October and British buyers are holding off purchases to get a line on the trend. Weakness in London could lead to some unsettlement here. British and European metal buyers can't forget prewar lead prices of four to five cents per lb.

The Lead Industries Association has gone to great lengths to assure consumers that this country can count on an adequate supply of lead as far as their current and future needs are concerned. It estimates there will be 1.3 million tons of primary and secondary lead available this year, which is 150,000 tons more than the total consumption of 1951. Any repetition of the extreme shortage of last year is regarded as highly unlikely and blame is placed squarely on Government interference for the squeeze.

Zinc Recovers, Demand Improves




Following its unpredictable behavior, the zinc price was suddenly advanced half a cent September 12 to 14½ cents a lb, when most observers thought that the metal would do well to maintain 14 cents for some time ahead. August statistics were a little better than expected in that slab stocks at the end of the month while still high at 96,651 tons, were reduced a few hundred tons below July. Shipments picked up sharply as galvanizers and diecasters placed orders sooner than expected after the steel strike. The total of 78,400 tons shipped compared with only 43,300 tons in July. Unfilled orders for slab declined slightly to 44,500 tons at the end of August. So far as known the Government took no zinc during the month for the stockpile.


Zinc futures on the New York Metal Exchange are quoted about the same as spot with little interest taken by speculative buyers. The outlook is for substantial offerings of foreign zinc both as concentrates and as refined metal. Reliable Canadian estimates place production in 1952 at 360,000 tons, up 20,000 tons over 1951. Further large increases are anticipated for 1953. Every month thus far in 1952 has seen an increase in Dominion production. At the same time Canadian consumption has been slipping and for the first half of 1952 was 25,600 tons against 32,400 tons in 1951. This leaves a larger margin for exports, nearly all of which goes to the United States.



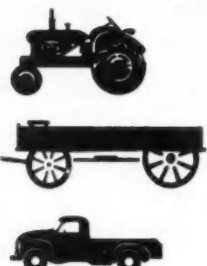
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Since 1880 Tuthill has specialized in designing springs to fit every specific need. Whether your spring requirements are for trucks, buses, automobiles, power shovels, farm wagons or dual and triple axle heavy-duty jobs—Tuthill can meet them quickly and economically. And now, MOLYBDENUM DISULPHIDE (MoS₂)... the newest Tuthill extra that keeps springs from *squeaking* and *galling*, is an added Tuthill feature that distinguishes this famous line.



Whatever your spring requirements may be—see Tuthill first!



TUTHILL SPRING CO.

760 W. POLK ST.,
CHICAGO 7, ILLINOIS

Two-Stroke Engines

(Continued from page 60)

supplies cooling air to the mechanism.

Since these engines are of the two-stroke type, the lubricant is mixed with the fuel. The recommended ratio is ½-pint of No. 30 oil to each gallon of gasoline.

A reed type valve is used between the carburetor and crankcase.

These engines are said to be suitable for a variety of applications—commercial and military—including: air compressors, bicycles, pumps, generators, portable saws, blowers, scooters, conveyors, and rotary mowers. One feature contributing to ease of installation on a specific application is the provision of the third bearing and mounting which may be seen attached to the lower end of the crankcase. This has a four-bolt collar for attaching the engine to the machine.



Exide

THE LONG-LIFE, FACTORY-FRESH BATTERIES THAT FIT ALL NEEDS

You can be sure you get the right battery for each specific job when you choose an Exide. Types, sizes and capacities are provided for every kind of automotive equipment—gas or diesel powered. There are Exide batteries for automobiles, trucks, tractors, buses, off-the-highway equipment, aircraft, motorboats.

Each Exide battery is a product of years of research-engineering that keeps pace with current automotive developments and anticipates future needs. Each is built to give you dependable performance, long battery life, low cost per mile of operation. Prompt deliveries of factory-fresh batteries are assured by the many Exide manufacturing and assembly plants.

Exide engineers will be glad to work with you on any of your storage battery problems.

THE ELECTRIC STORAGE BATTERY COMPANY

Philadelphia 2

Exide Batteries of Canada, Limited, Toronto

"Exide" Reg. Trade-mark U.S. Pat. Off.

1898...DEPENDABLE BATTERIES FOR 64 YEARS...1952



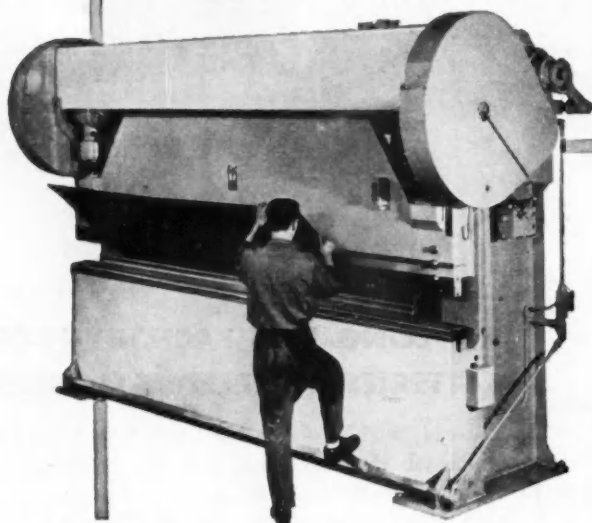
STARTING POWER

for light, medium or
heavy-duty service

How many Features can a Press Brake have !...

CHECK THESE BATH FEATURES

- ✓ Built-in overload release mechanism
- ✓ One-piece welded steel frame
- ✓ Removable adjustable dovetail slotted bed top
- ✓ Double-end drive from both housings
- ✓ Reversible unit flywheel assembly
- ✓ Twin Disc double-plate type clutch and brake
- ✓ Clear working space front and rear
- ✓ Tonnage indicators at each end of bed
- ✓ Up to 40% less power required

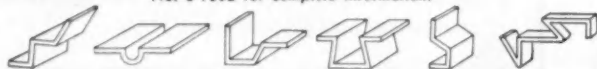


These are but a few of the 21 outstanding features you get in every BATH power press brake . . . the features that assure continuous trouble-free production. Superior construction of

BATH presses results in long service life, maximum safety for both operator and machine, minimum maintenance and quick installation. Patented release mechanism, which immediately disengages fly-wheel when excessive load is imposed, is one reason why BATH presses are noted as safe, dependable production tools.



Write today for illustrated 28-page Catalogue
No. S-1002 for complete information.



THE CYRIL BATH COMPANY

6915 Machinery Avenue • Cleveland 3, Ohio

New Products

For additional information please use
postage-free reply card on page 81

(Continued from page 80)

Light Paint Touch-Up Gun

Now on the market is a paint touch-up gun designed to spray light fluids such as thin lacquers, paints and chrome protective coatings. Known as Model B-10300, the gun will operate with as little as four psi.

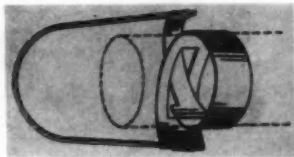


The gun body is aluminum, while all other parts are of brass. It is equipped with an air regulator to control the flow of material. The unit is available with one-quart, pint, 10-oz, and 4-oz containers so that colors may be changed rapidly. *Black Manufacturing Co.*

Circle P-9 on page 81 for more data

Hanger for Tail Pipes

Designed to solve the problems involved in storing and displaying automobile tail pipe, the PR3 pipe hanger contains a spring clamp which holds a single pipe firmly yet is easy to disengage.



One or a series of these hangers can be hung on nails in the wall at a handy spot. The clamp immediately loosens when the sides are pressed. *AP Parts Corp.*

Circle P-10 on page 81 for more data



rademark of stability

SPECIALIZED SERVICES

gaskets

Automotive, diesel, electrical, radio, refrigeration and many others

fabricated parts

Dashboard panels and insulators, sound deadening, interleaf spring liners, glove compartments, sun visors

glazing tapes

cork and rubber—all rubber types

extruded metals

Aluminum shapes, free cutting brass rods, forging brass rods, brass shapes. Products fabricated from extrusions

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Overhaul kits for overseas service to military specifications



More than a quarter century of service to America's largest manufacturers has proved the strength and stability behind the Dee-Gee trademark.

Large-scale production facilities, in seven modern plants, serve industry in many ways. We welcome the opportunity to discuss your requirements.

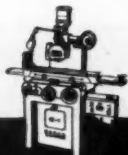


FRICTION

**DONE BETTER
WITH DoALL
BAND MACHINES
—BUILT FOR THE JOB!**

DoALL ZEPHYR HIGH SPEED BAND MACHINES — the ideal machines for friction cut-off sawing and friction contour sawing everything from gray iron castings to stainless sheet. Speed range up to 15,000 blade feet per minute. Single or variable speed models available with throat capacities from 16" to 60".

DoALL CONTOUR-MATIC BAND MACHINE used for friction sawing stainless steel, Hastelloy "B" and other ferrous alloys at a large research laboratory. This machine has a speed range of 40 to 10,000 blade feet per minute. It can be used not only for friction sawing but also for sawing, slicing, grinding, honing, polishing and filing any known material. It will contour-machine any shape.



SAWING

**DONE BETTER
WITH DoALL
FRICTION SAW BANDS...
DESIGNED EXCLUSIVELY
FOR THE JOB!**

Actual size
1/2" wide, 10 pitch friction saw band.

DoALL friction saw bands are manufactured in 1/2" and 3/4" widths .032 gage and 1" .035 gage, 10 and 14 pitch. They are sold in 500 ft. coils in exclusive "strip-out" containers or in cut and welded lengths for use on all high speed band sawing machines at speeds from 3000 to 15,000 blade feet per minute.



FRICTION SAWING is a process wherein the friction created by the 3000 to 15,000 feet per minute band speeds softens the metal being cut, by heating it to its forging temperature directly ahead of the band teeth. The teeth bite easily into this softened metal, hogging it out much faster than if the metal were cold.

Friction Sawing provides amazingly fast cutting of ferrous metals, including hard-to-machine alloys. Sheet steel 1/16" thick can be cut at 140 linear feet per minute. One-inch material can be cut at speeds up to six lineal inches per minute.

The speed and economy of friction sawing is greatly dependent upon the saw band used. The tooth design, pitch, set, band width, thickness, steel alloy and heat treating of DoALL Friction Saw Bands are all specially designed for the job. A unique hardening technique is used to give longer set life and increase tooth strength. The metallurgical characteristics of the band are peaked for maximum flex life.

Here are the benefits of DoALL Friction Saw Band de-

sign, as compared to any standard or substitute metal cutting band:

1. Faster cutting rate.
2. Less operator fatigue.
3. Less burr.
4. Less heat penetration (excessive heat destroys desirable alloy characteristics).
5. Longer blade life on straight and radius cutting.
6. Less downtime for blade replacement.
7. Lower labor costs.
8. Lower production costs.

Tests have proved conclusively that when all factors, particularly labor costs, are taken into consideration, the cost of friction sawing with DoALL Friction Saw Bands is as much as 15 times lower than with bands not designed for the purpose.

For the fastest, lowest cost cutting of ferrous metals, use friction band sawing with *DoALL machines and saw bands.*

Call DoALL today—ask for free literature and a demonstration of friction sawing at your own plant.



58-17

THE DoALL COMPANY
254 N. Laurel Avenue, Des Plaines, Illinois

In Canada: The DoALL Company of Canada, Ltd.
37 Clarkson Avenue, Toronto 10, Ontario, Canada



Service Classifications for Engine Lubricants

(Continued from page 69)

president of Caterpillar Tractor Co. The major automotive manufacturers were represented on Mr. Rosen's panel, along with men from the research departments of the oil companies.

After several months of cooperative work by these two groups, the new system was recommended for adoption by the API in November,

1951. However, it was not officially adopted until April, 1952.

It is important to realize that the new system in no way affects the SAE Viscosity Number Classifications. These will continue to be used to indicate the viscosity grades of motor oils regardless of their types or the services for which they may be recommended.

The basic idea behind the new API System of Service Classifications is that motor oils have to meet widely varying service requirements. Hence it is sound and logical to define and classify these requirements of different engine designs. Experience has also indicated that although oils can be made that will give superior results in gasoline engines under the most severe conditions, they will not necessarily be equally satisfactory for Diesel service and vice versa. Under the now obsolete API system an oil was required to be suitable for both gasoline and Diesel engines in order to be designated Heavy Duty Type.

To provide complete freedom for developments in oils, two sets of service classifications were set up—one for gasoline engines, the other for Diesels. The different services for either type are designated by letters, and it is expected that oil companies will identify their oils as suitable for the different types of service and design requirements by using the corresponding letters. For example, an oil suitable for the most severe service in gasoline engines would be identified as "For Service M.S." If it were suitable for normal service in Diesels, it would be identified as "For Service D.G." If it met the requirements of both services, it would be identified "For Service MS-DG."

In their use of the new system, it is anticipated that the automotive manufacturers will recommend on the basis of the design and service needs of their units. For instance, a passenger car maker might advise the use of motor oil designated "For Service MM" or "For Service M.S."

Naturally, there is certain to be some confusion during the period of changeover from the old API system to the new one. Two moves are being made to clarify this. First, the API will soon publish a leaflet explaining the new system. It is anticipated that this will be widely distributed by oil companies. Second, the SAE Fuel and Lubricants Technical Committee is preparing information intended for publication in the 1953 Standards Handbook.

The oil companies are acting as rapidly as possible to put the new system into effect by marking oil containers, or otherwise indicating the services for which their various

WHEREVER EXTRA PERFORMANCE COUNTS

Specify *Leece-Neville*



L-N ALTERNATOR SYSTEMS
Include dry-plate rectifier. Capacities from 50 to 175 amps. for 6, 12, 24, 32 volt systems.



L-N HIGH-CUT-UP DC GENERATORS
50 to 2100 watts. Types available for all requirements.



L-N REGULATORS
Patented, double-contact, long-life design, hold voltages to close limits.



L-N CRANKING MOTORS
Heavy-duty construction for quick, dependable starting. Up to 35 HP.



L-N FRACTIONAL HP MOTORS
Standard production includes 3/4" to 1-5/8" shaft, for 6 or 12 volts. Other designs and voltages available.



L-N SWITCHES
Hand and magnetic for standard and series-parallel systems.



L-N AIR CRANKING MOTORS
For safe starting of diesel engines in fire hazards. 10 to 20 HP. Rugged and dependable.

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THE LEECE-NEVILLE COMPANY • CLEVELAND 14, OHIO

Heavy Duty Electric Equipment
for Over 43 Years


TRUCK


BUS


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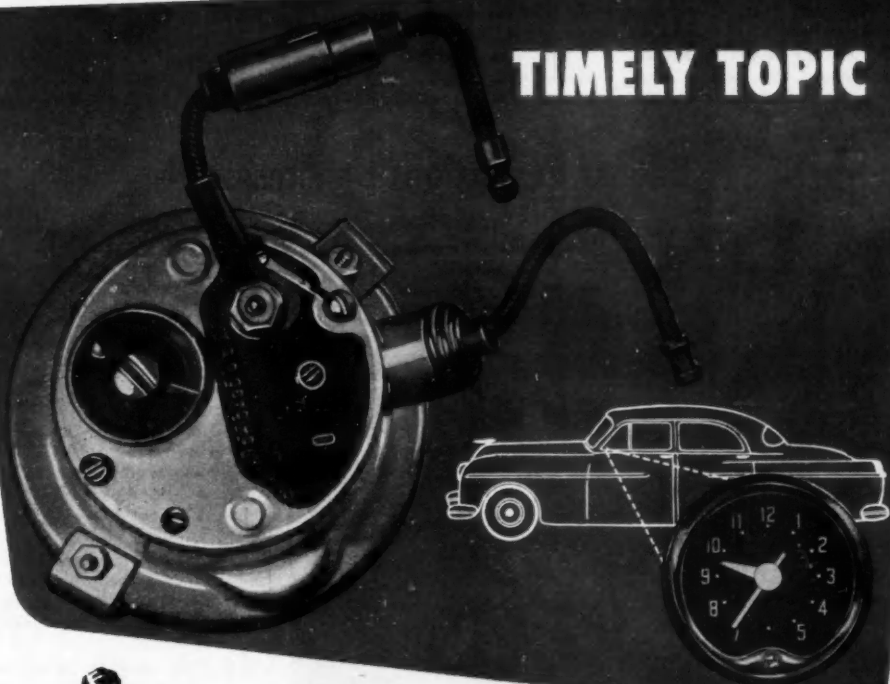

PASSENGER


RAILROAD


MARINE


INDUSTRIAL

TIMELY TOPIC



To the Executive Planning for TOMORROW...

A switch to aluminum for parts of this Borg automobile clock eliminated electroplating, lengthened tool life, increased machine output, reduced shipping and handling weight and assembly time . . . all important factors in the always timely topic of cost reduction.

Aluminum will not rust and has a permanent, naturally attractive appearance—thus requires no plating. Aluminum greatly extends tool life and increases machine output, because aluminum is more easily fabricated in press operation. Tools do their work easier and presses run at higher speeds, for longer periods of time between reworking of dies.

Overall weight is now 31% less in this clock, thanks to aluminum. This lowers transportation costs in shipping from manufacturer to auto assembly plant, reduces handling costs in the plant and provides faster, easier assembly into the automobile.

Reynolds Aluminum Specialists will be glad to work with you on your design and production problems. They'll show you how aluminum can reduce your costs—just as it reduced costs of this electrically operated automobile clock manufactured by the George W. Borg Corporation, Delavan, Wisconsin. Write Reynolds Metals Company, 2587 So. Third St., Louisville 1, Ky.

See "Doc Carkle" with Eddie Mayehoff, Sunday night, 7:30 EST and PCT, NBC-TV; hear "Fibber McGee and Molly" Tuesday night, 9:30 EST, NBC



REYNOLDS ALUMINUM

brands are suitable. This will, of course, take time because of stocks on hand throughout their distribution systems. As this report is written, it is understood that several large automobile companies will use the new

Service Classifications as a basis for the recommendations in their 1953 instruction books.

Time alone will tell how the new system will work, but it is sound in principle and flexible in application.

If the fine cooperation between the two industries that has resulted in the development of the new system is continued in its use, there should be little difficulty with it, once it is understood by the vehicle operator.

Rubber Restrictions Unnecessary

B. F. Goodrich Co. recently issued No. 14 in a series of rubber studies which it has been conducting for some time. Entitled "The Rubber Outlook

and a Study of Cartels and Their Consequences", this report by Goodrich President John L. Collyer first traces the development and unfortu-

nate results of various schemes designed to restrict crude rubber output. It shows that in every instance restrictive cartels were foredoomed to ultimate failure because they were founded on fundamentally unsound economic theories.

Outlook for the Future

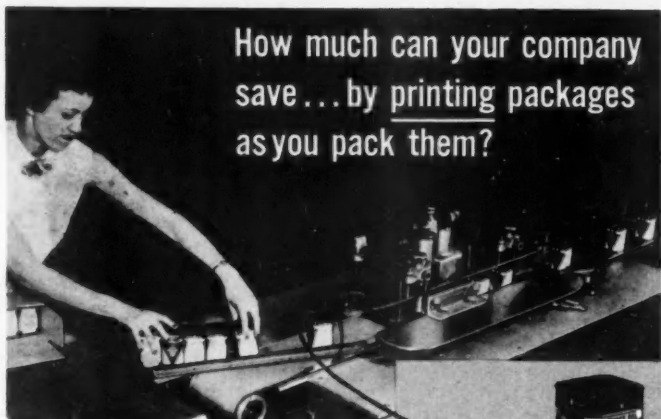
After reviewing the past history of crude rubber in the light of regulatory attempts and their consequences, the report turns to the future with the following predictions:

1. Within the present decade, there will be a market for all of the crude rubber which can be produced at a price competitive with the principal man-made rubber (GR-S).
2. There is little likelihood of a "burdensome surplus" of crude rubber.
3. Except in the event of another world war, "serious shortages" of rubber can be prevented by increasing the output of man-made rubbers.
4. Therefore, a cartel to prevent "burdensome surpluses" or "serious shortages" is not necessary.
5. A cartel to regulate the output of crude rubber would increase production costs and would ultimately cause the consumption of crude rubber to decline.
6. A cartel to regulate the output of all kinds of rubber could not be organized during this period of international tension.

Recommended U. S. Actions

The report goes on to state the belief that there are actions which should be taken by the U. S. Government and by the governments of the crude rubber producing areas that will be of immediate and long-range benefit to all the peoples of the free world. The former, they assert, should take action to:

- a. Sell or lease to private industry all Government-owned, man-made rubber-producing facilities as quickly as possible. Now that we have achieved national security, (Turn to page 130, please)



How much can your company save ... by printing packages as you pack them?

Gottschalk MARKOCODER slashes package inventories ... eliminates production-line down-time ... cuts losses from package obsolescence ... simplifies inventory control ... reduces labor cost.

Here's the new cost-cutting way to make a single basic package do for dozens of different parts and accessories. Place a MARKOCODER in your line—let it print name, number, other product identification on one or more blank panels of a partially-printed container ... automatically ... as an integral packaging function. The MARKOCODER synchronizes with other mechanized operations ... delivers accurately registered "print-quality" impressions consistently. Prints cartons, boxes, cans or canisters ... on top, ends or bottom. Quickly adjustable for copy changes, packages of different size. Designed for top efficiency under continuous heavy production schedules. Requires only 5 minutes for daily cleanup.

Get the whole cost-saving story of the MARKOCODER; write today for Brochure AFM

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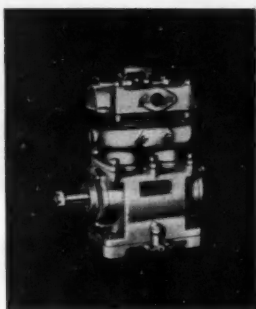
Machines to MARK whatever you MAKE

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THE WORLD'S MOST TRIED
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AIR BRAKES

You're looking at . . .
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for any Braking System!



THE BENDIX-WESTINGHOUSE COMPRESSOR
—heart of the air brake system—performance proven over more miles on more installations than any other compressor available!

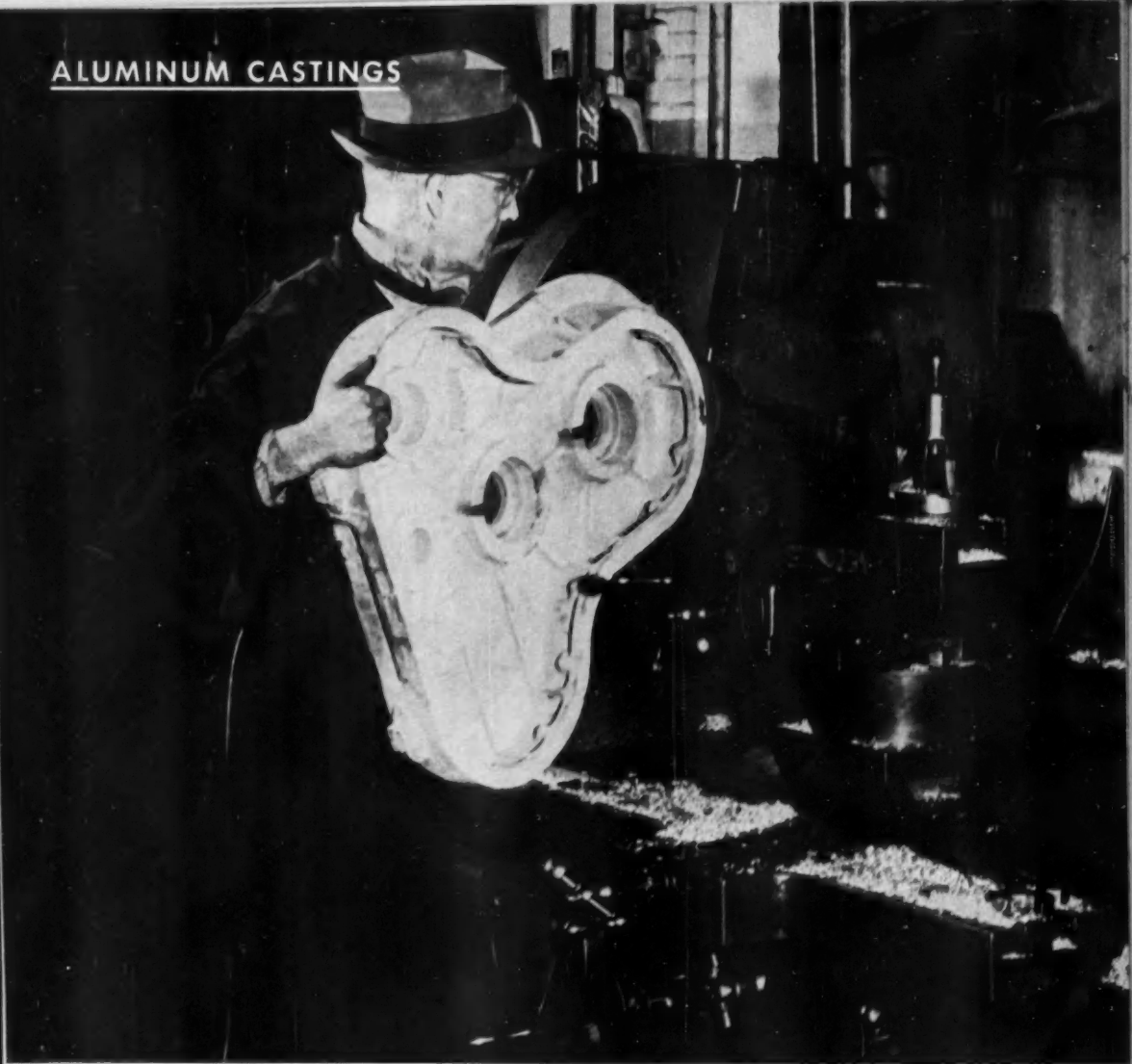
That's right—the bus industry, due to the very nature of day after day city driving . . . **requiring a truly terrific number of braking applications per mile . . .** is recognized as the world's toughest test for any braking system. And over the years the men who build and operate the nation's buses have made Bendix-Westinghouse Air Brakes first choice for this rough and rugged braking chore. But what does this mean to you? It means when you specify Bendix-Westinghouse Air Brakes for your trucks as well as your buses, you specify a **completely proven braking system** ready to deliver full power and performance under any and all driving situations. What's more, it means you specify the world's finest compressor—built on the same **proven reciprocating piston principle** as the engines in your vehicles—with a demonstrated ability to maintain full air pressure under even the most grueling conditions—for **longest service life at lowest maintenance cost!** Take advantage of it—specify Bendix-Westinghouse, the world's most tried and trusted air brakes!

BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE COMPANY
ELYRIA, OHIO

BERKELEY, CALIF.



ALUMINUM CASTINGS



CASTINGS YOU CAN LIFT WITH EASE

ALCOA makes four kinds in aluminum—sand, plaster, permanent-mold and die

You don't have to look farther than your own shop to see the advantages of castings that weigh one-half, even two-thirds, less. Think how often castings are lifted while being machined, finished, assembled, and shipped. The savings in man power with aluminum castings are impressive.

Look, too, at the other commercial advantages of Alcoa Castings. Ease of machining. Corrosion resistance. High conductivity of heat and electricity.

How about price? Alcoa Castings are competitive with castings of many other metals. Their cost, finished and assembled in your product, often amounts to surprising

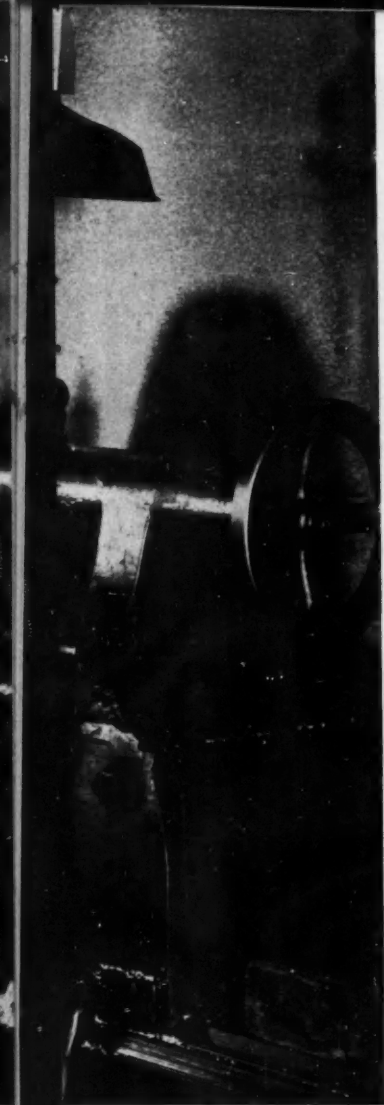
savings over heavy metals.

We have been making aluminum castings for 41 years. We have been working with aluminum for 64 years. To aluminum's natural advantages, we add the extra measure of sound and skillful design help. Any of our four foundries or two die-casting plants, located from coast to coast, are open for your inspection. Contact your local Alcoa Sales Engineer, listed under "Aluminum" in the classified phone book.

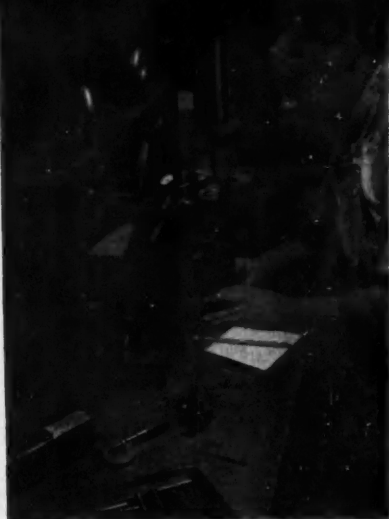
ALUMINUM COMPANY OF AMERICA

1903K Gulf Building • Pittsburgh 19, Pa.

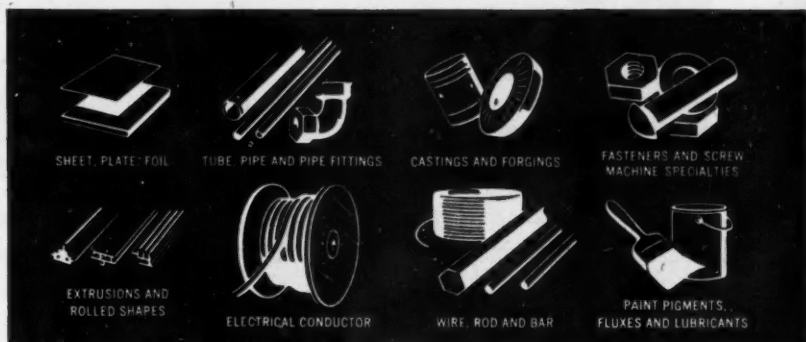




High production of permanent-mold castings in Alcoa's Cleveland foundry is illustrated by this automatic machine for making pistons.

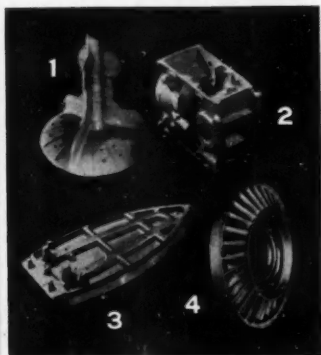


Dimensional check of a completed die in Alcoa's die-casting plant at Chicago.



Remember, ALCOA makes "everything" in aluminum

While the sale of our products is limited by government regulations, you'll find no limitations on help in design, application, or fabrication.



Typical castings made by Alcoa. 1. Permanent-mold washing machine agitator. 2. Sand-cast machine part. 3. Die-cast electric iron soleplate. 4. Plaster-cast automotive torque converter.



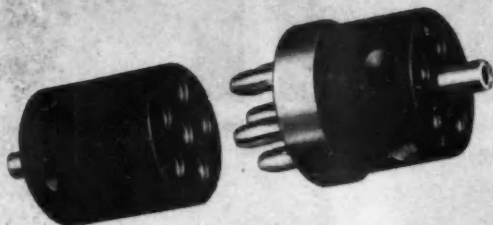
Setting a die in a large die-casting machine at the Chicago plant.



A line of automatic molding machines, indicating the high production capacity for sand castings at Alcoa's Bridgeport, Conn., foundry.

where **HARD RUBBER** is right...
use it!

how to SIMPLIFY DESIGNS



6-HOLE
ELECTRICAL
CONNECTOR

with **ACE**[®] extruded hard rubber

**SAVES
MACHINING
MOLD COSTS**

Just conjure up the right hard rubber extruded shape, and the job of making many a small part is half done! The electrical connector above, for example. For good electrical properties, stability and strength, it's made of ACE hard rubber rod with the six holes extruded right in it. Simply cut it off to length, soften by heating, press in the metal inserts, and presto! An amazing variety of shapes and compounds of ACE Hard Rubber are possible, even extruded directly over metal rods and tubes. Machines and finishes as easily as brass. Stir your imagination? Write for more facts today.



Keep your ACE Hard Rubber and Plastics Handbook handy. Free on request. It's a gold mine of hints like these.

American Hard Rubber Company

93 WORTH STREET • NEW YORK 13, N. Y.

Rubber Restrictions Unnecessary

(Continued from page 126)

there is no justification for competition by the U. S. Government with private producers of crude rubber in other nations.

- b. Until the Government-owned facilities are disposed of, maintain the selling prices of Government-produced rubbers at levels which will recover full costs and return a reasonable profit on the invested capital.
- c. Issue a clear-cut statement of policy assuring both producers and consumers of rubber that the strategic stockpile of crude rubber now owned by the Government will be used only for the purpose of military and essential civilian security and will, under no circumstances, be used to manipulate rubber prices.

Foreign Government Steps

The governments of the crude rubber-producing countries, the report states, can advance the interests of their own peoples by:

- a. Encouraging the growing of food by rubber producers and the diversification of crops, thus providing protection against declines in crude rubber prices.
- b. Encouraging lower production costs by bud grafting and seed selection to increase yields, and greater mechanization of methods of collection, washing, drying, and milling.
- c. Educating the smallholders to improve the quality of the grades of rubber they produce so that they may obtain a higher price for their product.

Benefits of Program

Such constructive government actions will make it possible for the reasonably efficient crude rubber producers to compete successfully for a large share of the rubber market and will provide a sound foundation for permanent improvement in the standard of living in the crude rubber growing areas.

Such a program should be of major assistance in the fight against communism in those areas.

And such action should be in accord with the sound concept that a dynamic expanding world economy will, through increased production, bring higher standards of living to all peoples.



HERE'S THE "IRON MAN" of the steel construction business! *Elmes Hydraulic Bulldozer*

Shown in operation is a 200-Ton Elmes Hydraulic Bulldozer, working in the shop of one of the country's larger steel construction companies. This customer reports his Elmes Bulldozer *"has been busy without interruption since it was installed . . . has performed a tremendous amount of bending and straightening work . . . turned out a greater number of pieces than ever anticipated."*

There are sound reasons why Elmes Hydraulic Bulldozers receive such enthusiastic recommendations. They're built rugged for rugged work—heavy bending, forming, straightening. Bed and frame are of simplified, solid design, using bolted and keyed construction of structural

steel. And the design is *clean*. Top of the press is clear—free from obstructions. Pumping unit is located low, at the end of the press. The press is protected. You can bring work to the press—position it quickly, from an overhead traveling crane. Head is adjustable for varying the work space opening.

Elmes Hydraulic Bulldozers are available in capacities up to 500 tons, with bed size, stroke and speed optional to suit your requirements. Your Elmes distributor can give you full details on these versatile presses and on the complete line of Elmes Hydraulic Metal-Working Presses. See him now—or write us for Bulletin No. 1010 B.

American Steel Foundries

CALENDAR

OF COMING SHOWS AND MEETINGS

SAE National Aeronautic Meeting,
Los Angeles, Calif.Oct. 1-4
Paris Automobile Show, Paris,
FranceOct. 2-13
American Society of Tool Engi-
neers, International Area, Hotel
Statler, Buffalo, N. Y.Oct. 10-11
Society of Industrial Packaging and
Materials Handling Engineers,
7th Annual Exposition, Chicago,
Ill.Oct. 13-16

National Safety Congress, Chicago,
Ill.Oct. 20-24
National Metal Show, Convention
Hall, Phila., Pa.Oct. 13-24
National Metal Congress; Am. So-
ciety for Metals—Hotel Ben
Franklin, Am. Welding Society
—Bellevue—Stratford Hotel,
Inst. of Metals Div. of Am. In-
stitute of Mining and Metal-
lurgical Engineers—Hotel Adel-
phia, Society for Non-Destruc-
tive Testing—Hotel Sylvania,
Phila., Pa.Oct. 13-24
37th International Motor Exposition,
London, EnglandOct. 22-Nov. 1
SAE Transportation Meeting, Pitts-
burgh, Pa.Oct. 22-24
American Gear Manufacturers As-
sociation, semi-annual meeting,
Edgewater Beach Hotel, Chi-
cago, Ill.Oct. 26-29

Transport Aircraft Hydraulic Con-
ference, Park-Sheraton Hotel,
Detroit, Mich.Oct. 23-29
American Society of Body Engi-
neers, Seventh Annual Techni-
cal Convention, Rackham Bldg.,
Detroit, Mich.Oct. 23-31

SAE National Diesel Engine Meet-
ing, St. Louis, Mo.Oct. 30-31
16th Annual Time and Motion Study
and Management Clinic, Indus-
trial Management Society,
Sheraton Hotel, Chicago, Ill.
Nov. 5-7

SAE National Fuels and Lubricants
Meeting, Mayo Hotel, Tulsa,
Okla.Nov. 6-7

Third Annual International Moto-
rama, Los Angeles, Calif.Nov. 7-16

2nd Annual Midwestern Tool Engi-
neering Conference, Urbana, Ill.
Nov. 8

API 32nd Annual Meeting, Conrad
Hilton Hotel, Chicago, Ill.Nov. 10-13

Montreal Tool and Equipment
Show, Shaw Mart Building,
Montreal, CanadaNov. 11-14

Third Annual Mexican Road Race,
El Ocotal-NogalesNov. 13-24

7th Midwest Conference, American
Society for Quality Control,
Claypool Hotel, Indianapolis,
Ind.Nov. 20-21

Society for Experimental Stress
Analysis, Annual Meeting and
Exhibition, Hotel McAlpin,
New York, N. Y.Dec. 2-6

National Standard Parts Association
Congress, Ambassador Hotel,
Atlantic City, N. J.Dec. 8-9

Automotive Service Industries Show,
Atlantic City, N. J.Dec. 10-13

1953

43rd National Motor Boat Show,
Grand Central Palace, New
York, N. Y.Jan. 9-17

SAE Annual Meeting, Sheraton-
Cadillac Hotel, Detroit, Mich.
Jan. 12-16

Plant Maintenance Show, Public
Auditorium, Cleveland, Ohio,
Jan. 19-22

Western Computer Conference,
Hotel Statler, Los Angeles,
Calif.Feb. 4-6

National Transport Vehicle Show
and Fleet Maintenance Exposi-
tion, New York, N. Y.Feb. 24-27

Pacific Automotive Show, Civic
Auditorium, San Francisco,
Calif.Feb. 26-Mar. 1

American Society for Testing Mate-
rials, Spring Meeting, Detroit,
Mich.Mar. 2-6

National Association of Corrosion
Engineers Ninth Annual Con-
ference and Exhibition, Hotel
Sherman, Chicago, Ill.Mar. 16-20

German Vehicle Show, Frankfurt,
GermanyMar. 19-29

Eighth Western Metal Congress,
Pan-Pacific Auditorium, Los
Angeles, Calif.Mar. 23-27

Fifth Materials Handling Exposi-
tion, Convention Hall, Philadel-
phia, Pa.May 18-23

American Society for Testing Ma-
terials, Chalfonte-Haddon Hall,
Atlantic City, N. J.June 23-July 3

Eighth National Instrument Con-
ference and Exhibit, Chicago,
Ill.Sept. 21-25

Cut
master model
costs
50%

REZOLIN
TOOL-PLASTIK

the only
non-shrink casting resin



Photo courtesy Ford Motor Company.

A thermosetting liquid phenolic plastic of exceptional dimensional stability and ease of handling, Rezolin Tool-Plastik is mixed cold and readily poured without pressure into simple molds. Rezolin Tool-Plastik models, masters and production duplicates are easily manufactured in your own plant without expensive shop equipment or highly skilled labor. *Non-Shrink* Rezolin Tool-Plastik eliminates the need for shrink patterns. It may be machined and polished by the use of conventional shop equipment.

Other Applications for Rezolin Tool-Plastik

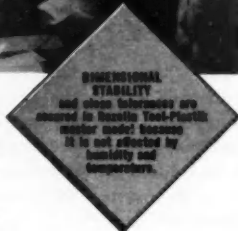
Stretch dies ... Acrylic form dies ... Double-action draw dies ... Foundry patterns ... Check fixtures ... Polyester laminating molds ... Trim and routing fixtures ... Master models ... Jig bases ... Hydropress dies ... Spinning chucks.

STABILITY — The dimensional instability of hardwoods in master tooling is a recognized problem. Rezolin Tool-Plastik is not affected by variation in temperature and humidity.

SAVES TIME — Rezolin Tool-Plastik cuts tooling time 50%. Hand finishing is practically eliminated because Non-Shrink Rezolin is cast not from mold or master.

DUPLICATING — Patterns of Rezolin Tool-Plastik are more accurate, harder and more durable. They are quicker and cheaper to construct, alter and duplicate and quicker and easier to resurface and restore.

DURABILITY — Rezolin Tool-Plastik is impervious to weather and aging; needs no protective coatings.

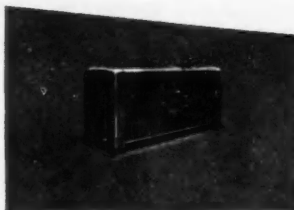
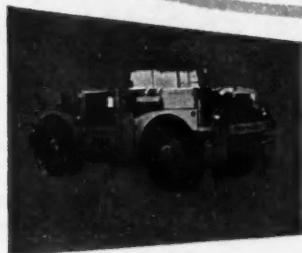


Complete 6 1/4-lb. sample kit sent for \$5.31. Freight post-paid. Write for Master Model Application Bulletin AI-10.

REZOLIN
TOOL-PLASTIK

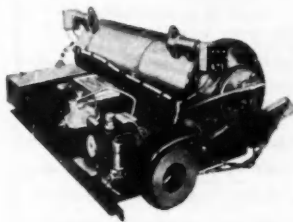
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Serving Industry Since 1938
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Los Angeles • New York

if it's worth starting...



IT'S WORTH EQUIPPING WITH JANITROL

liquid heaters



If you want to make sure that a military or commercial vehicle is fully equipped to start and function over the entire range of operating conditions—right down to 65°F below zero—write *Janitrol liquid heaters* into the specifications. Recent tests under the severest operating conditions have proved beyond question that the new 90,000 Btu-per-hour capacity Janitrol liquid heaters insure positive starting without special fuel capsules—at minus 65°F after a 72-hour cold soak. On the A-2 bomber tow tug, for instance, in 65°F below zero weather the engine can be started and the tow tug rolling well within 30 minutes after heater is switched on—or the heater can be used to raise the engine temperature to 160°F and maintain standby warm engine and operating parts in any weather. In addition to assuring *all-weather operation* Janitrol liquid heaters extend engine life and cut maintenance by preventing sludge formation and other deteriorating effects resulting from low operating temperatures. Call your nearby Janitrol representative for prompt help on any automotive or aircraft heating requirements.

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NOC-OUT HOSE CLAMPS

*The Standard
of the Automotive
Industry*



Type A—Radiator
Hose Connections



Type HP—High
Pressure Hose
Connections

Type G-BB—Booster
Brake Hose Connections
No. G-B-HH
for Hot Water
Heater Hose

Wittek Noc-Out Hose Clamps are designed in a variety of types made in many sizes for use by the automotive industry. Because they provide the most practical leakproof hose connection, they are specified by the leading manufacturers as standard, original equipment for automobiles, buses, trucks and tractors.

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HOSE CLAMPS

WITTEK

MANUFACTURING CO.

4319 W. 24th Place, Chicago 23, Ill.

Dependability in Hose Clamps
for Over a Quarter of a Century

MEN in the NEWS

(Continued from page 41)

Briggs Mfg. Co.—Ernest W. Rother was named to the newly-created post of supervisor of the master mechanic's division, to coordinate customer contracts.

Federal Motor Truck Co.—Harleigh R. Holmes, Jr., has joined the firm as chief engineer.

Ford Motor Co., Lincoln-Mercury Div.—Paul S. Mabie has been named to the manufacturing staff, and Robert J. Neville replaces him as plant manager at St. Louis, Mo. Edward J. Bond replaces Neville as plant manager at Metuchen, N. J., and Harold H. Keays is promoted to acting manager at the Los Angeles, Calif., plant.

Gould - National Batteries, Inc.—Orman P. Du'ac has been appointed manager of the Depew plant. He succeeds C. Ernest Smith who has been named manager of the new plant in Kankakee, Ill. Joseph W. Pallatt has assumed the duties of plant manager of the Trenton, N. J., Industrial Div. plant, and N. P. Nelson is now manager of the Monroe, Mich., plant.

General Motors Corp.—Hugh Dean, former vice president in charge of the manufacturing staff, has been appointed special assistant to the Secretary of Defense for expediting military production.

General Motors of Canada, Ltd.—Appointment of E. J. Umphrey as vice president has been announced.

New Departure Div. General Motors Corp.—Kenneth D. Mackenzie has been named assistant chief engineer and will head the newly formed special section concerned with instrument bearings.

Synchro-Start Products, Inc.—William L. Stelter was promoted recently to executive vice-president.

Bonney Forge & Tool Works—Fred S. Durham, Jr., vice-president and treasurer, has also been named director of sales.

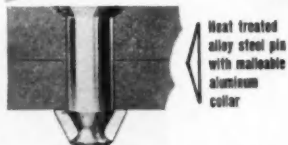
Tubular Products Div. of Babcock and Wilcox Co.—William J. Thomas, general sales manager, has been named a member of the board.

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RIVETS

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PARTS FASTER-BETTER**



Heat treated
alloy steel pin
with malleable
aluminum
collar

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Save both weight and time in aircraft assembly by using Pheoll Hi-Shear Rivets. These precision made fasteners are easy to install and provide maximum shear strength when critical parts are joined.

PHEOLL'S EXTENSIVE MANUFACTURING FACILITIES provide the aircraft industry with a constant source for alloy steel, stainless steel and 75ST Aluminum Alloy Hi-Shear Rivets in all types and sizes.

Partial List of Styles Available

- NAS 177 100° Countersunk Head
- NAS 178 Flat Binding Head
- HS 287 Close Tolerance 100° Countersunk Head
- NAA 386 Stud Rivets
- HS 11 Brazier Head
- HS 23 Close Tolerance 100° Countersunk Head—75ST Aluminum Alloy
- HS 26 Flat Binding Head—75ST Aluminum Alloy
- HS 27 Close Tolerance 100° Countersunk Head—Close Tolerance Shank
- HS 28 Flat Binding Head—Close Tolerance Shank
- HS 37 Close Tolerance 100° Countersunk Head—Close Tolerance Shank—Minimum Tensile Strength 160,000 p.s.i.
- HS 38 Flat Binding Head—Close Tolerance Shank—Minimum Tensile Strength 160,000 p.s.i.
- HS 47 Close Tolerance 100° Countersunk Head—Interference Fit—Minimum Tensile Strength 160,000 p.s.i.
- HS 48 Flat Binding Head—Interference Fit—Minimum Tensile Strength 160,000 p.s.i.

NOTE: Other types made to customer's specifications. Ask about Hi-Shears for industrial use.

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BOLTS
NUTS**

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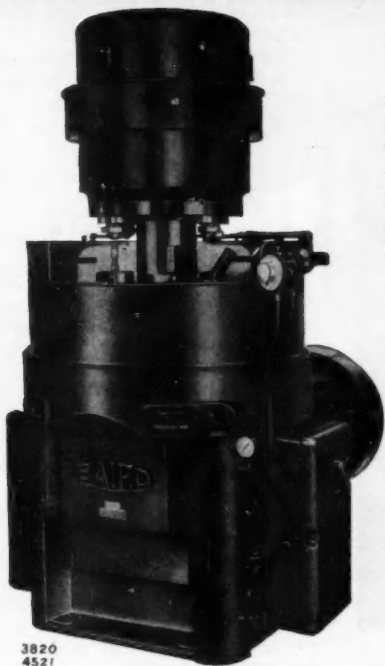
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ABOUT IT!

It's **AUTOMATIC . . . it's FAST . . . it's ACCURATE**

FEATURES: Turret (work spindle carrier) turns continuously, grip of holding fixtures automatically releasing for operator to unload and load. Tools move horizontally for facing operations . . . other tools vertically for turning operations. Machine is designed for dry or wet cutting of light jobs, boring piston ends, facing, turning bands, ogives, etc.

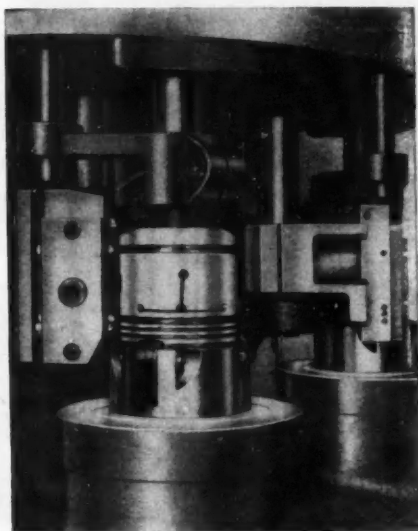
The turret is driven through worm and gears . . . spindles mounted in roller bearing and driven by helical gears. Changes in all speeds are easy . . . inexpensive. Convenient spindle control station at left, control at right for turret and tool arms . . . arranged to prevent feed of tools to work unless spindles are revolving. Both turret and spindles are driven by V belts. Electrical equipment is enclosed, wiring concealed.



3820
4521

Left: Front view, showing splash guards for wet cutting.

Right: A close-up view of typical tooling set-up.



BAIRD 4-SPINDLE VERTICAL CONTINUOUS LATHE

The machine mounts four 5" chucks on a spindle circle of 18". Spindle speeds 240-860 r.p.m. Longitudinal tool stroke $3\frac{1}{4}"$. . . cross tool stroke $2\frac{3}{4}"$. Feeds .001" to .030" per revolution. Spindle drive 3 to 5 H.P. with push button control; machine drive 1 H.P. Spindle carrier cycle time 12-38 seconds. Production time 3-9 seconds per piece. Cutting time 9-28.5 seconds. Now's the time to "ask Baird about it."

HORIZONTAL AND VERTICAL TOOLING

the **BAIRD MACHINE COMPANY**
STRATFORD • CONNECTICUT

Tubeless Tire Possibilities

(Continued from page 52)

from leading tire manufacturers. Automobile engineers were quite unanimous in their opinion that the tubeless tire would not appear on 1953 models. There was indication, however, that if a concerted attack were made on the problem during the coming year and if all major tire producers were in position to supply

an acceptable tubeless tire within the year, then there was some likelihood that such equipment would be seriously considered for introduction in 1954.

Before this happens, however, co-operative action will be needed to resolve some serious questions in the minds of the automobile builders.

First of all, can the tubeless tire compete with conventional tires in prime cost? Those outside the tire industry feel that cost must be comparable to make the new equipment attractive to the motor car producer and, consequently, assume that cost will be in line. On the other hand, some of the tire engineers are not yet sure that the tubeless tire can be produced initially at costs equal to that of conventional tires. This conservative attitude stems from the fact that not all major tire companies have finalized their ideas on the subject.

Engineers who have tested tubeless tires for some time visualize the following advantages that may stem from their adoption:


1. Lighter weight.
2. Better balance.
3. Cooler running.
4. Better ride and handling.
5. Less susceptible to fast leaks in event of puncture.

Nevertheless, the change to a tubeless tire is so drastic that many engineers would prefer a casing having self-sealing properties. Although Goodrich introduced the self-sealing type several years ago and has sold such tires through replacement channels, for various reasons this type of tire is not being considered for original equipment service. Those who are willing to accept the tubeless tire hope that some form of self-sealing ultimately will be in the picture.

Contacts with tire manufacturers indicate that while many are working hard on this development, the situation is not yet clear cut. There are serious problems of production and training of operators; engineering problems still remain to be resolved; and there is the question of ultimate cost. Tire producers are cost-conscious and naturally unwilling to commit themselves in advance on the matter of relative cost.

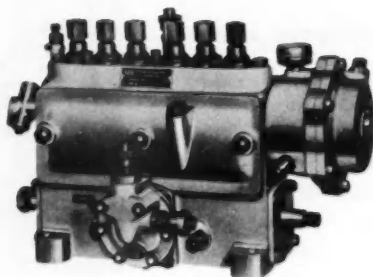
Tubeless tires will require special rims with adequate provisions for sealing. Since the rim and wheel become a part of the tire, special attention must be given to sealing and design of tire valves and their economic application to the rim. And a few of the motor car builders who are interested in using wire wheels are wondering what can be done to adapt tubeless tires to wire wheel equipment.

Some of the tire companies not now selling tubeless tires are studying the special problems incident to the installation initially and at service stations. They believe that consider-



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a
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to

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able educational effort will have to be expended in the service field among thousands of dealers and tens of thousands of independent service stations to assure proper handling of service problems.

If and when the tubeless tire were to be adopted, it would also require advance planning of proper equipment for mounting tires in car assembly departments; and provision of special tools in all field service stations.

Meanwhile, Goodrich reports that its Life-Saver tubeless tire, offered for sale early in 1948, met with enthusiastic response from the motoring public and that considerably more than a million tires have been sold through replacement outlets in the USA. Moreover, the Life-Saver equipment is now available through Goodrich stores and dealers in the US and Canada.

Goodrich also reports that Life-Saver tubeless tires cost more than conventional tires but substantially less than tires with the so-called safety tubes. It is, therefore, of interest that several months ago this company introduced a companion tubeless tire without the puncture-sealing feature or the Grip Block tread of the Life-Saver tire.

Early this year, Goodrich advises it was granted patents covering an air-tight lining, the sealing ridges that lock the tire to the rim, and a sealant that seals punctures as they occur.

Obviously, Goodrich has made considerable progress in this field. However, current exploitation has been confined to the replacement market and the company still has no definite statement as to prospects for original equipment installation. For one thing, Goodrich realizes that automobile producers simply cannot make so radical a change until all major tire companies are ready with a competitive product and one that has been service tested and proved.

The situation at the moment is substantially this: some of the leading tire companies, and chassis engineers as well, believe that a tubeless tire possessing qualities of easier riding, better service, and greater safety at high speeds can be developed in the future. Whether or not the entire tire industry—or at least the major producers—can hit its stride simultaneously in time to meet 1954 models still remains an open question.

Certainly, progress is a character-
(Turn to page please)

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**Insulated
Thermocouple Wire
Extension Lead Wire**

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No matter what your wire or insulation requirements may be, you can depend on Gordon "Serv-Rite" insulated wire for pyrometers—recognized as a standard of highest quality for nearly half a century. All "Serv-Rite" wire is now manufactured in the new, completely modern Gordon plant, employing up-to-date equipment and machinery, supervised and operated by skilled technicians—your guarantee of continued precision quality. In addition to maintaining large stocks of all common types of wire, Gordon will manufacture special insulation, in long or short runs, to suit your individual needs and meet your most rigid specifications.

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And you'd scarcely believe the improvements we've made in welded steel tubing since 1902.

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ELECTRUNITE tubular steel products help many industries make things stronger . . . or lighter to move . . . or attractive longer . . . or safer . . . and at lower cost.

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"Inch-Marked" E.M.T. . . . Electrical Metallic Tubing . . . light, strong steel tubing raceway to protect electrical wires against fire, moisture, and impact.



Mechanical Carbon Steel Tubing . . . made in a wide range of grades, sizes, and wall thicknesses to make all types of products lighter, stronger.



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Stainless Steel Tubing and Pipe in a full range of sizes, types and wall thicknesses for chemical and food processing equipment, and mechanical applications.



Rigid Conduit . . . heavy-wall steel protection for wires in explosive and hazardous locations.



Heat Exchanger Tubes, both carbon and stainless steel, for all types of heat exchangers, condensers, process equipment, and heaters.



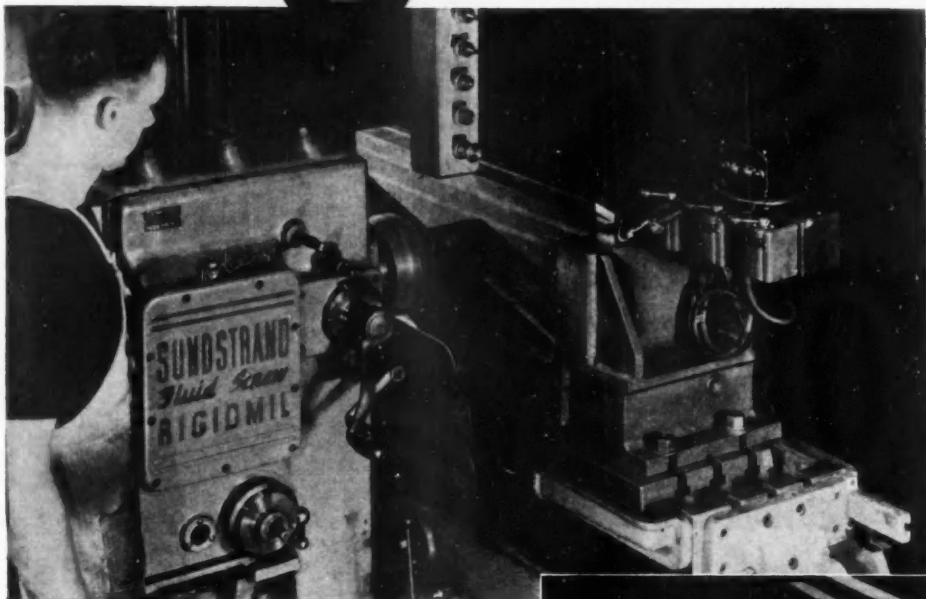
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STEEL AND TUBES DIVISION
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ELECTRUNITE TUBING

How to use **Sundstrand** "Engineered Production" and Equipment for... **1** **Small Lot Milling**



Here's an excellent combination for increasing production and cutting costs on miscellaneous milling. It consists of a Sundstrand Model 33 Rigidmil equipped with a Sundstrand Magnetic Fixture. Parts machined include tool blocks, cam bars, tool slides, motor brackets, etc. Lot sizes vary from 1 to 25 pieces, and time reduction averages 50% over former method. In addition to saving time through the elimination of mechanical clamps, these magnetic fixtures save the costs



of special jigs or fixtures. Install a combination like this and you'll be surprised at the number of different parts you'll be able to mill faster and better. Call in a Sundstrand methods engineer. He'll be glad to help you.



RIGIDMILS

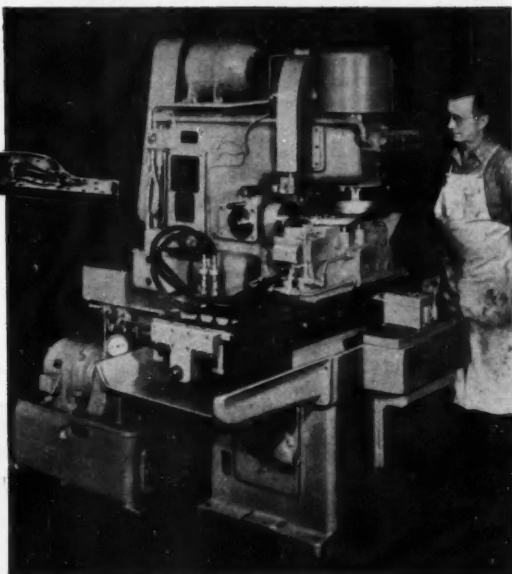
• AUTOMATIC LATHES

• HYDRAULIC EQUIPMENT

2

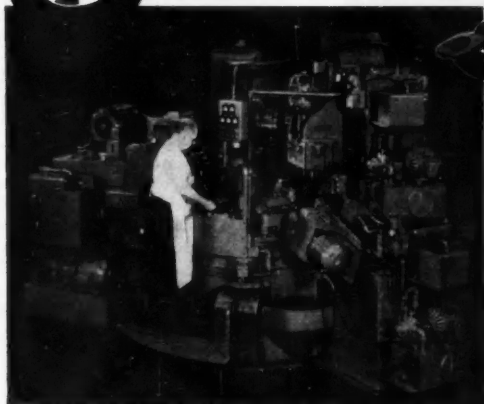
Production Milling

Here's an entirely different approach to a milling problem. This Sundstrand Model 22 Rigidmil is equipped with a special two spindle head, one vertical and one horizontal. With the addition of the vertical spindle, both the top and one side of these aluminum castings are milled simultaneously in one automatic cycle. Rate of production is approximately 50 flanges per hour. Production milling problem solutions like these are the result of Sundstrand "Engineered Production." This service consists of designing the most profitable processing method first, then obtaining machines to suit this method . . . standard or semi-standard machines if possible, or entirely special machines, if necessary.



3

Special Machining at High Production

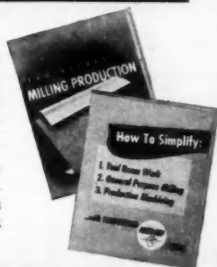


Here's a good example of a special machine designed to perform basic milling operations and

including drilling and counterboring operations. It is a special 5 station process machine that completes these operations on exhaust manifolds with one handling of the part. All operations are performed at the rate of 113 manifolds per hour.

FREE additional data

For complete information on Sundstrand "Engineered Production" including specific tooling and production data, write for Bulletin No. 602. For more information on Sundstrand Magnetic Fixtures, ask for Bulletin No. 224.



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Machine Tool Company

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DRILLING AND CENTERING MACHINES

SPECIAL MILLING AND TURNING MACHINES

istic of the automotive industries, and if the tubeless tire offers superior qualities, combined with safety and comparable cost, there is little question about the outcome of this unique development. Ultimately, the public

will decide whether the tubeless tire is a success. For it will take the accumulated experience of millions of tires on new cars to determine the success or failure of this promising venture.

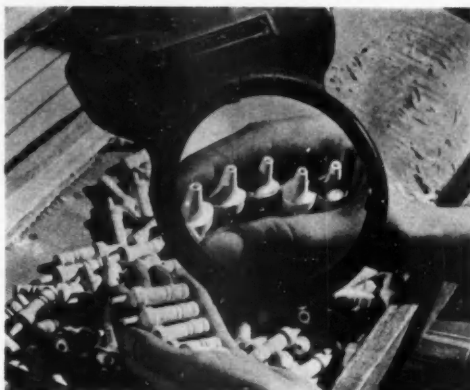
Latest Tractor Developments

(Continued from page 48)

In the discussion, a representative of Allis-Chalmers reported that the addition of a torque converter in the

standard power train of one of their models increased gear life by about 50 per cent.

For Tops in High Voltage Insulation



you can
count on

FRENCHTOWN CERAMICS

..... because of constant quality control

Test after test assures long life and dependable performance of spark plugs made with Frenchtown insulators. Every insulator—and all other Frenchtown ceramic parts—are given rigid tests for high dielectric strength and superior surface quality before and after glazing. Firing is accurately controlled to insure close tolerances, high heat resistance and mechanical strength.

Through research and development, Frenchtown engineers are constantly improving product quality to anticipate customers' requirements. These are the plus factors that mean top performance of any Frenchtown porcelain parts you may specify. Don't fail to send today for current engineering data and any design help you may need.

FRENCHTOWN PORCELAIN CO.

81 Muirhead Ave.

Trenton, N. J.

Twin Disc observed that if the operator wanted to get about the same gear life when using a torque converter, it would be possible to handle from 15 to 17 per cent more horsepower through the same drive.

Looking to the requirements of military service, Kilty, Lammers, and Fleck, Caterpillar Tractor Co., presented the results of a research project on the starting of cold Diesels, with particular emphasis upon positive starts at temperatures around minus 65 F. Their results may be quickly summarized as follows: Electric and air starting systems with glow plugs or other aids provide good starting down to 0 F. An auxiliary gasoline-starting engine is reliable without aids at all temperatures down to minus 25 F. Below minus 25 F, it is imperative to employ standby or quick warm-up heating systems.

According to B. W. Kelley, Caterpillar Tractor Co., the use of the lighter non-additive oils, now preferred by engineers for various reasons, has brought with it an increasing tendency to score heavily loaded gears. The author defines this type of scoring as a welding and tearing action resulting in noise and pitting, and ultimate failure.

The author emphasizes the complexity of the problem of mathematical analysis, lists seven variables or factors having a significant effect on scoring resistance, finally develops an empirical formula which is said to correlate with test results. Initial analysis indicates that temperature alone may be the ultimate basis for the failure of straight mineral oils.

The problem of keeping dirt and dust out of tractor engines is so serious that one of the sessions was devoted to a symposium on air cleaners. In introducing the subject, E. S. Dahl, Massey-Harris, stressed that dust, regardless of particle size, causes wear in an engine. Field tests as well as laboratory results show substantial reduction in engine wear with higher air cleaner efficiencies. It is also demonstrated that leaks in the induction system can be disastrous. The author's analysis indicates that engine life might be phenomenal by comparison with average results were it possible to prevent wear caused by abrasion and corrosion.

Since it is impossible to design an air induction system having 100 per cent efficiency, the object of current research is to uncover every means for improving efficiency above the value of 99 per cent now commercial.

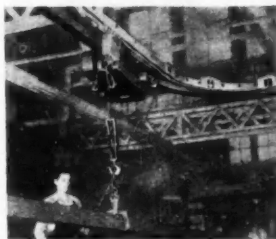
(Turn to page 145, please)



Here's power that moves with the job. No long extension cords to trip up workers, slow down production.



Industrial Trol-E-Duct with tap-off outlets in boxes feeds motors on a moving test line. Power where you want it!



Heavy-duty mobile hoist is fed from trolley moving in duct. Trolleys are available for virtually any load requirement.

Production rolls when power supply rolls with it!

Bulldog Industrial Trol-E-Duct lets power feed go right along with the job. Saves up to ½ hour per man per shift.

Where production equipment must move freely, Industrial Trol-E-Duct provides the means. This modern, highly flexible system of electrical distribution not only carries current to the job, but supports heavy tools. Rated at 100 amperes.

Trolleys, riding overhead in continuous duct slot, tap power from enclosed bus bars and relay it to portable power tools, hoists, cranes and other moving "loads." You get power that rolls right along with the

job . . . mobility that means extra production. Users report savings up to ½ hour per man per shift.

Entire system is prefabricated, standardized for easy installation. Dismantles and reinstalls swiftly, speeds up plant change-overs. Completely salvable, safe, efficient, guaranteed.

Get the complete story on Bulldog Industrial Trol-E-Duct. Call in a Bulldog Field Engineer, or write direct for free bulletin.



This slot is the secret of mobile power. Through it, Industrial Trol-E-Duct provides a continuous power outlet.



Cross section of duct and trolley. Steel wheels and spring-button contacts assure smooth-rolling, positive-contact trolleys.



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• Moisture-Proof • Radio Quiet • Single Piece Inserts • Vibration-Proof •
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SAVING TOOL. CUTS SCREW
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Hand starting or pre-positioning screws in assembly operations is no longer necessary; a high energy permanent magnet in bit chuck holds the bit and energizes it with 10 times the "pull" to hold the screw firmly on bit. Labor costs are cut.

Reduces bit costs through the use of super hard, low-cost interchangeable insert bits.

Reduces bit wear and replacement since the energized bit seats itself positively in the screw slot or recess.

Bit holders available for all makes of power and spiral drivers. Also super hardened tool steel insert bits for all types and sizes of screws.

Permanently Magnetic Magna-Tip Hand Screw Drivers . . . bits for all types and sizes of screws and Magna-Tip Hex Drivers for hex head screws

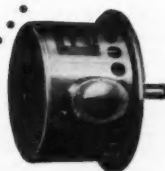
U. S. Patent No. 2,550,775

Write for folder 90-E, information and prices

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Standard



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**HOWELL ELECTRIC
MOTORS CO.**
HOWELL, MICHIGAN

(Continued from page 142)
cially feasible. The trouble is that the one per cent permits enough dirt to ruin an engine under certain operating conditions. Apparently there are several avenues of approach in gaining some additional efficiency without penalty. Robert E. Larson, Donaldson Co., reports on the results of a series of field tests indicating that major improvement can be effected by the simple act of relocating the air cleaner. He recommends moving the air cleaner to the extreme forward corner of the tractor and adopting a straight-through extended inlet.

It may be noted parenthetically that although this is a simple and direct approach, it requires advance planning before the design of a new tractor is frozen.

Even though an air cleaner may have an efficiency of 99 per cent, there are dust conditions around heavy machinery which make the remaining one per cent of dust a destructive influence on the engine, according to David P. Eastman, United Specialties Co. He pointed out that a gain of only $\frac{1}{2}$ of one per cent in efficiency could reduce by 50 per cent the amount of dust entering the engine.

Mr. Eastman's report suggests that considerably more efficiency is potentially possible if full advantage is taken of existing known methods. The drawback is that this benefit can be obtained only by coupling two or more units in series. This means that the multiple system will require still more space in machines where space already is at a premium. The author admits that many tractors and machines now in service do not lend themselves to the application of these additional stages.

The best answer appears to lie in an analysis of the problem at the time the vehicle is being designed and to provide space for the elements of the most efficient air cleaner installation before design is frozen. The author illustrates a suggested arrangement for a three-stage air cleaner system as a guide to good design.

AUTOMOTIVE INDUSTRIES . . .

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MANUFACTURING

News of the MACHINERY INDUSTRIES

(Continued from page 73)

Simplified Non-Precision Tools

Another significant feature of the postwar production of machine tools is the decrease in weight per unit or, in other words, the reduction in the size of each unit. This is due in many cases to the simplification and

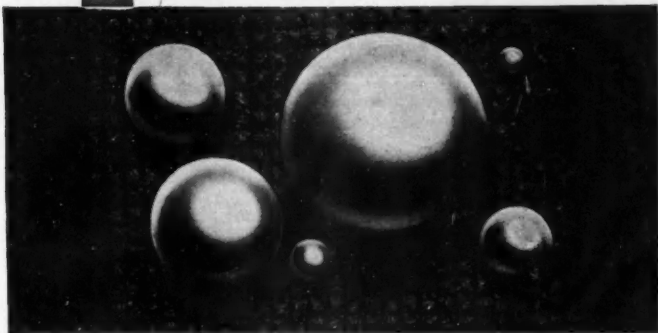
de-precisioning of machine tools. Thus the predominance of small, simple machine tools has been a feature of the postwar production of machine tools in Japan. Such a trend toward the simplification and reduction in the size of machine tools tended to impede, rather than promote, the early recovery of the domestic machine tool industry which had technically fallen behind that of the western countries during and after the last war. This trend also would lead one to make the conjecture that once again, as in the prewar

IN

size and spherical accuracy

perfection of surface

uniformity—dependable physical quality



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And the service results from every Strom metal ball prove it—not only in the finest precision ball bearings but also in the lot of other ball applications where Strom balls are doing the job better.

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▶ **UNLIMITED ROTARY MOTION**—The meshing of the screw-type flexible Cable and the specially hobbled gear of the Teleflex Control Box allows unlimited rotary motion.



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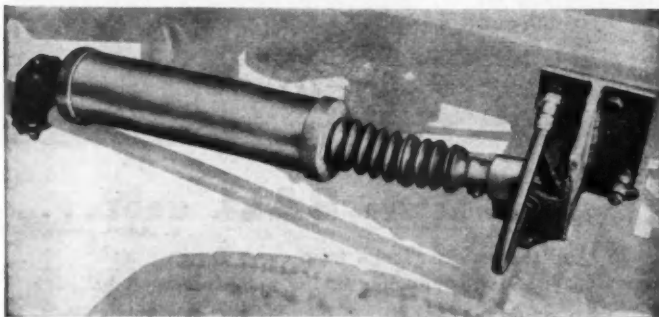


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▶ For further information write for Catalog 300B. Engineering data for calculating operating loads and backlash is available also.

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Technical information furnished upon request.

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News of the

MACHINERY INDUSTRIES

(Continued from page 145)

days, Japan is depending upon foreign supplies for the renovation of the important machine tools essential for the machinery manufacturing industry of this country.

Japan's Exports

In the past, exports of machine tools had accounted for a very low percentage of Japan's total production. Although some increase in exports took place during the last war, such exports were made chiefly for the military purpose of promoting the development of the arms industry in Manchuria and China. There were practically no exports of machine tools in the true sense of international commodities.

At first, the volume of exports was very small, but it sharply increased after 1950. However, this increasing trend of exports, especially to areas other than former Japanese possessions, is believed to be due chiefly to the worldwide shortage of machine tools consequent upon the outbreak of the Korean war in June, 1950. If such a favorable trend of exports is to be maintained in the future by Japanese machine tools, they will have to acquire the status of international commodities in respect to both technical quality and prices.

From 446 companies existing in the most brisk period of the wartime, the number of Japanese machine tool makers has sharply declined since the war, reaching the low of 21 companies in June, 1951. This decline was due to the abandonment of machine tool production by a large number of makers through conversion to other lines or complete suspension of operations in view of the disappearance of munitions demand after the war.

At the present time more than half of even these principal makers are operating at less than 50 per cent of their capacity for machine tool manufacturing and are maintaining their business by carrying on concurrently the manufacture of other products, such as Diesel engines, printing machinery, paper manufacturing machinery, sewing machines and textile machinery.

The domestic demand for machine tools is limited chiefly to small simple units and it appears that the de-



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mand has not yet extended to the principal basic machine tools (high-grade precision equipment). As a matter of fact, the Japanese automobile industry which of late is pushing forward its modernization program, has been drafting plans for the installation of imported machine tools for the greater part of the equipment requiring renovation. Among the various industries which have drafted machinery import programs, the machinery manufacturing industry ranks next to the iron and steel industry in the large size of its import

POSTWAR PRODUCTION OF MACHINE-TOOLS IN JAPAN

Year	No. of units	Weight (tons)	Average weight per unit (tons)	Index of production of machine-tools ¹	Index of production of all machinery ¹
1943	60,134	140,753	2.34	1,210.3	500.0
1945	7,306	11,828	1.62	101.7	283.7
1946	4,791	4,291	0.89	36.9	60.8
1947	5,544	3,235	0.58	27.7	64.8
1948	6,457	4,332	0.67	37.2	98.2
1949	6,579	4,465	0.68	38.4	114.5
1950	4,039	2,895	0.71	24.8	120.4
1951	9,139	4,714	0.52	40.5	208.1

(¹) 1932-36=100.

Source: The Industrial Bank of Japan, Ltd.

YOU CAN'T TEAR THIS FEATHERWEIGHT COATED FABRIC



Here's what you have been waiting for — a new and revolutionary lightweight coated fabric for scores of industrial applications.

Vulcan's newly developed "COVERLIGHT" combines extremely light weight (only 5½ ounces per square yard) with exceptionally high resistance to tearing. Tensile strength also is unusually high.

"COVERLIGHT" is especially useful in aircraft and aviation applications, such as wing covers, engine covers, tail surface covers, baggage tarpaulins, control surface seals, etc. It is used as a protective covering for any kind of machinery, automotive tarpaulins, light weight carrying cases, protective covering for sports fields, etc.

"COVERLIGHT" is a nylon fabric, coated with synthetic rubber. Get your sample of this "featherweight" waterproof fabric that is so tough you can't tear it. Also available in 6½, 10, 12 and 14 ounce per square yard. Write for complete specifications and samples.

VULCAN RUBBER
PRODUCTS, INC.

56TH STREET AND FIRST AVENUE, BROOKLYN 20, N. Y.

program. The fact that even the domestic machinery manufacturing industry, which constitutes the major user of machine tools, depends upon imported machine tools for its principal equipment is one of the problems now confronting the Japanese machine tool industry.

In order to cope with these problems the machine tool makers are now doing their utmost to lower the cost of production through technical improvement and rationalization. Since it is necessary to import high-grade machine tools to achieve this objective, the Japanese Government has begun active support by providing for subsidies up to one-half of the cost in those cases where machine tools are imported for such purpose.

Tungsten Carbide Flame-Plated at 400 F

A method has been devised of flame plating tungsten carbide on metal parts at a relatively low temperature —not exceeding 400 F. Developed by Linde Air Products, the deposit is made in the form of a coating which can be applied in thicknesses ranging from 0.0005 in. to 0.020 in. Surfaces up to six-in. wide and 40-in. long can be coated with the firm's present equipment. One of the advantages of the process is that the carbide coating is not diluted into the base metal in any fashion.

The as-coated surface has a surface finish of 125 microinches rms, but this may be ground to a finish of approximately two microinches rms. Hardness of the coating is 89 on the Rockwell A scale.

Currently, according to Linde's A. K. Seeman, articles to be flame-plated have to be prepared by the customer, sent to Linde's Indianapolis plant for coating, and then returned to the customer.

Forging 135 steel balls per minute



for processing **TACONITE**

The tremendous possibilities presented to the steel industry through the processing of low grade iron ore (TACONITE) has resulted in unusual interest in methods for the production of steel balls by hot forging. Illustrated here is an ACME 1" Ball Forging Machine for the continuous production of hot forged hard steel balls from $\frac{1}{2}$ " up to and including 1", made from stock diameters smaller than the nominal size of ball.

Operated by one man, this ACME Forging Machine automatically feeds bar stock



through the feed rolls at the proper speed for maximum efficient operation of the machine, producing 135 balls per minute, with adequate safety devices to prevent jamming of the die.

Complete information is available for all those interested in the details of this special purpose ACME Forging Machine. Made in 1" and 2" capacities.

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***Parco Compound**—rust resistant . . . used on iron and steel articles, small and large, simple and complex.

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***Parco Lubrite**—wear resistant for friction surfaces . . . used to create a nonmetallic phosphate "break-in" coating on gears, cylinder walls, pistons, rings, shafts, valves and rods.

***Parco Prime**—corrosion resistant paint base for use on structural steel and custom fabricated articles too large to process by conventional methods . . . single coat, spray or brush applied, creates uniform prime coat on iron and steel.

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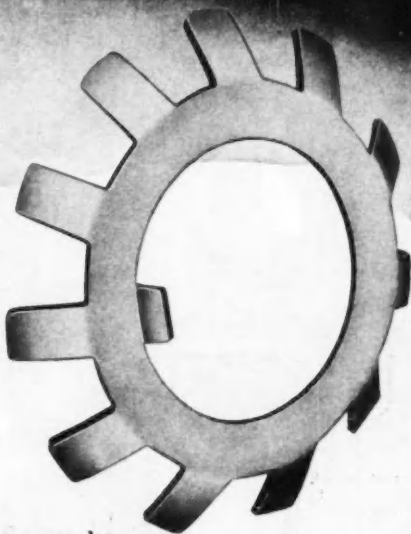
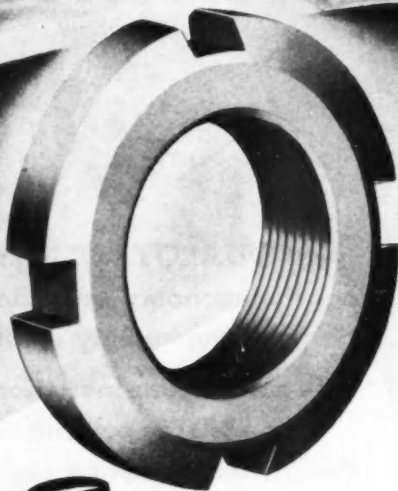
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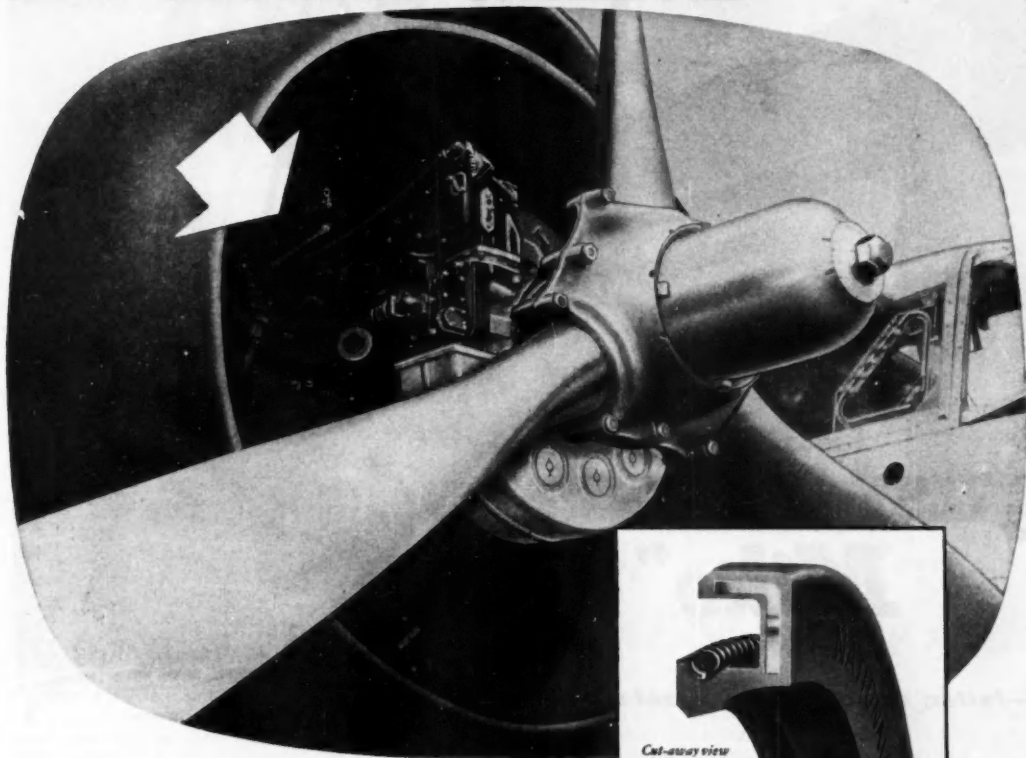
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Cut-away view of Hycar rubber seal. Seal has 6 1/2" i.d., molded onto metal base, is spring-tensioned, precision-trimmed.

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PREVENTING leakage from propeller oil control assemblies is a vital job—calls for a seal with unique advantages. The seal must be positive, must resist the deteriorating effects of oil, extreme temperatures and high surface speeds.

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These Hycar rubber seals are suitable for use with AN-O-8 Grade 1100 and AN-O-9 Grade 1010 fluids, and MIL-O-5606 oil.

Perhaps one of the many Hycar rubber compounds can solve a problem for you—can help you improve or develop a sales-making product. For Hycar resists oil, gas, heat and cold, aging, abrasion and many chemicals. For helpful technical informa-

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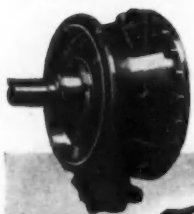
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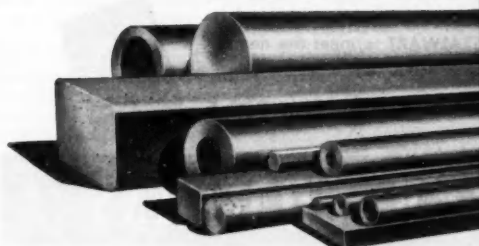
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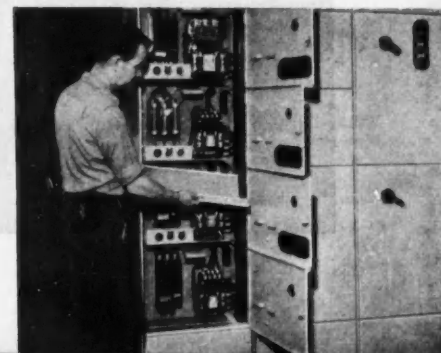
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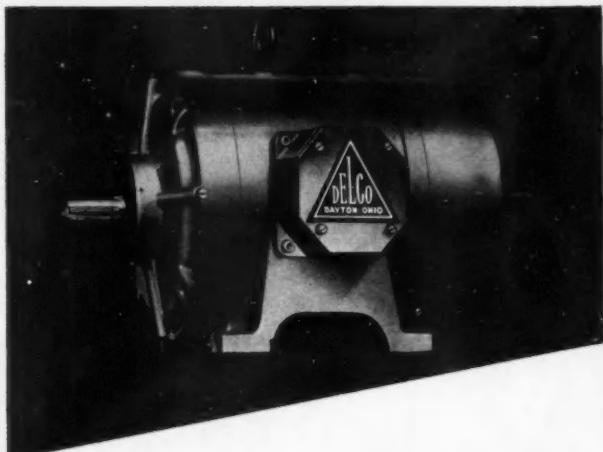
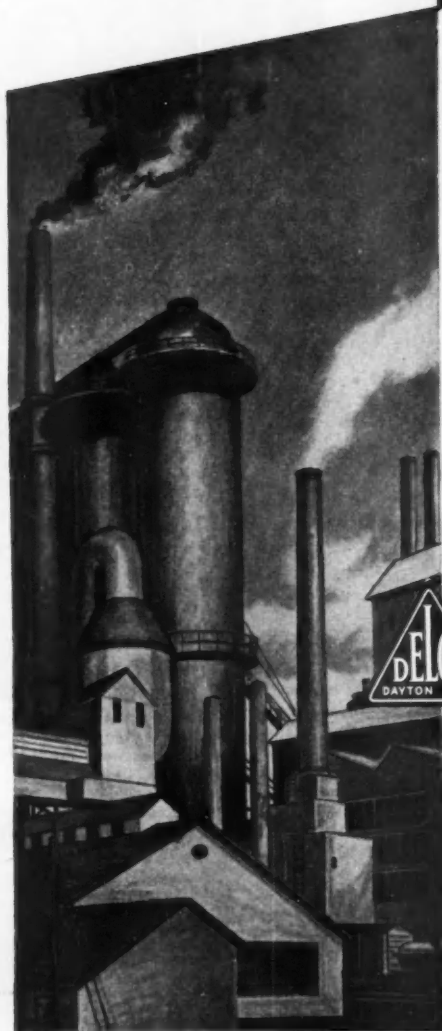


EASY TO SERVICE. Units are easily disconnected from bus and locked in test position (above). Barriers between units are easily removed to facilitate wiring (below).



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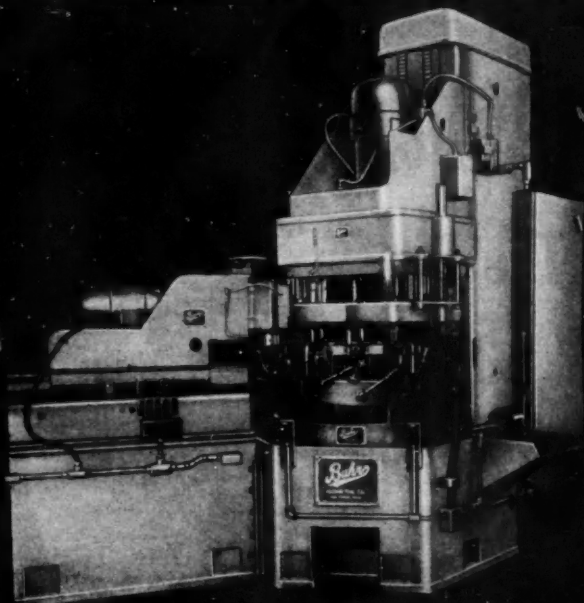
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One of Their Problems



To mill, drill and tap a Water Outlet Connection—that was their immediate problem. To make the Equipment to handle this phase of their production, they called in Buhr.

What the Machine Does

In general—it mills mounting Flange; combination drills and reams 2 holes and spotfaces small Flange surface; combination bores 2 holes and drills 2 holes; combination counterbores and countersinks 2

holes, and combination drills and reams 2 holes, and taps 2 holes.

Specifically, the Machine does this—

Station 1—Load and Reload

Station 2—Mills mounting Flange surface

Station 3—(1st Position) Combination drills and reams (2) .406 dia. holes; (2nd Position) Spotfaces small Flange surface to 2.320 dia.

Station 4—(1st Position) Combination bores (2) .350 dia. and (1) .440 dia. bore; (2nd Position) Drills (2) .257 dia. holes.

Station 5—(1st Position) Combination counterbores (2) .570 dia. and (2) .06 dia. holes; (2nd Position) Countersinks (2) 90° x .280 holes.

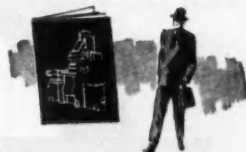
Station 6—(1st Position) Combination drills and reams (2) .328 dia. holes; (2nd Position) Taps (2) $\frac{1}{8}$ -18 Class 2 holes. PRODUCTION—144 Parts at 100% Efficiency.

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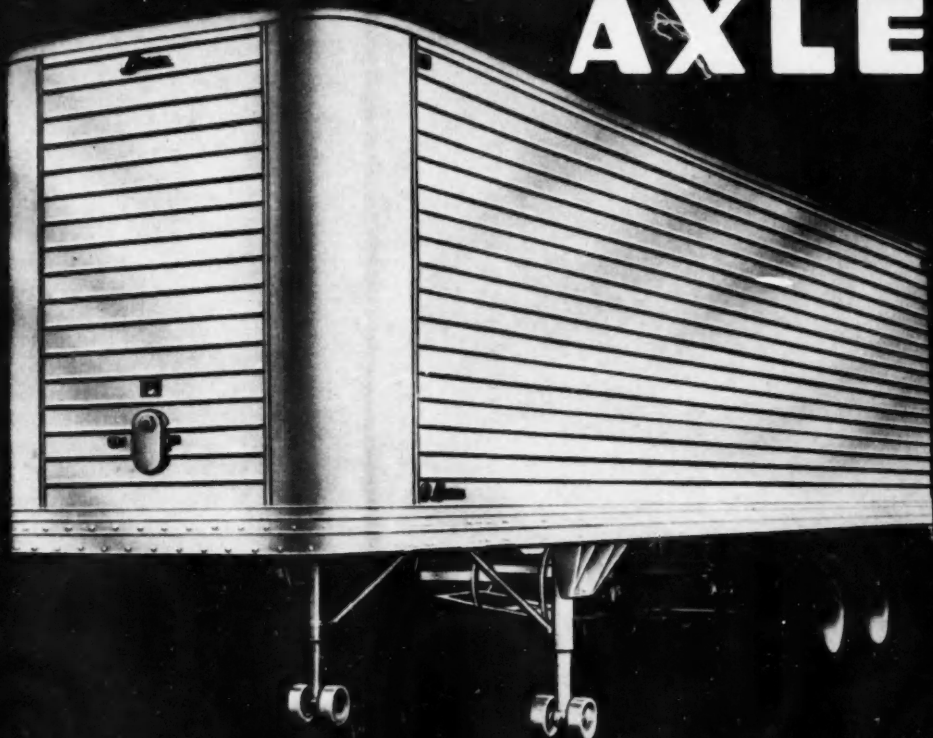
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